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MOTOR PERFORMANCE OF VISUALLY HANDICAPPED CHILDREN

Charles Edwin Buell

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MOTOR PERFORMANCE OF VISUALLY HANDICAPPED CHILDREN

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PREFACE

In June, 1950, the material contained in this book was presented to the Graduate Division of the University of California in partial satisfaction of the requirements for the degree of Doctor of Education in educational psychology.

The writer is under obligation to many people for their cooperation and assistance. He is particularly indebted to Dr. Frederick T. Tyler, Chairman of his Thesis Committee, and Professor Frederick W. Cozens, Director of Physical Education, and the other members of the Committee at the University of California —Professor George C. Kyte, Professor Theodore L. Reller, Dr. R. Nevitt Sanford, and Dr. Alex C. Sherriffs; to the superintendents and teachers of the schools and Braille classes for the blind for their cooperation; to Dr. Anna Espenschade for many helpful suggestions; to Mr. Edward Bowes for checking many of the computations; and to others for valuable assistance. Finally, the writer wishes to thank his wife, Mrs. Josephine L. Buell, for her untiring assistance and for making many helpful criticisms.

Charles Edwin Buell

Berkeley, California
July, 1950

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INTRODUCTION

The Problem

This study attempts to measure gross motor performance of blind and partially seeing children and compare it with the motor performance of seeing pupils in public schools. Much information is available on normal pupils but very little is known about the motor performance of the visually handicapped.

Children who cannot use their eyes for education in the regular classroom are severely handicapped. It is reasonable to assume that defective vision might affect motor performance. Only a few of the many possible relationships can be considered here. The amount of vision and the duration of visual handicap will receive attention along with certain conditions surrounding defective vision. Two of these conditions which seem to be important in motor performance are attitude of the parents toward the child and the physical education the visually handicapped receive in school and elsewhere. The relationships between programs of physical education and motor performance are so complex that only a few considerations of a general nature will be included in the study.

For competition in track and field events, a chart worked out for seeing pupils has been found useful in classifying visually handicapped children, but it is not known whether or not this is the most valid method for the purpose. The present study evaluates the method and develops best-fit classification formulas for children with defective vision. Revised track and field achievement scales for the visually handicapped are also included.

Justification

If it is important to understand the motor performance of normal children, it is also essential that teachers and administrators know what may be reasonably expected of blind and partially seeing children in physical activities. There has been little scientific investigation in the field and information has not been available.

When educators understand the influence of visual handicaps on motor performance, more intelligent curriculums in physical education and vocational subjects can be planned for blind and partially seeing children.

Definitions

Performance is what the individual does at any one time. Standardized scores are used to represent performance on achievement scales. Ability and performance are identical only when the individual expends maximum effort. Although motivation was not a problem in this study, it is reasonable to assume that performance rather than ability was measured in a certain percentage of cases.

The amount of vision is interpreted here in terms of usefulness rather than according to the Snellen chart or other similar devices. A child with enough vision to see sidewalks and follow them easily was considered to have useful vision and was classified as partially seeing. In this study the word "blind" will be used to refer to children who have no useful vision.

Survey of Related Information

Since many references on motor performance of pupils in public schools are available, only a few of the most pertinent will be mentioned here. Sargent's [1] vertical jump was one of the first motor tests widely used. Norms were available with the test when it appeared in 1921. It is still one of the best measures of explosive energy or power.

A few years later Rogers[2] obtained a strength index with a reliability over .90 by measuring the following:

1. Lung capacity (spirometer)
2. Arm strength (pull-ups and push-ups. Modified for girls)
3. Grip strength (manuometer)
4. Leg lift and back lift (dynamometer)

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[1] D. A. Sargent, "The Physical Test of a Man," American Physical Education Review, XXVI: 188 (April, 1931).

[2] F. R. Rodgers Tests and Measurements Programs in the Redirection of Physical Education (New York: Teachers College, Columbia University, 1927).

When the strength index is divided by the predicted strength index for any given age and weight, a physical fitness index is obtained. The chief disadvantages of the test are that trained people and expensive equipment are required to administer it. In fact, the equipment is almost unavailable now. Since this is one of the more reliable tests in physical education, it has been rather widely used, particularly in the state of New York. Even the School for the Blind (Batavia) in this state uses the Rogers test. However, this is the only school for the blind which has given this test much attention. After administering the test for many years, Michael Goldberg[3] found that his pupils were only a little below seeing children in strength and physical fitness.

Shortly after Rogers' work appeared, David K. Brace[4] published his test of motor ability consisting of twenty stunts. The underlying philosophy of this test was rather similar to that of the more familiar intelligence tests. Each of the stunts, which varied from easy to difficult, was scored in terms of success or failure. Although it is still a good test of motor performance, certain disadvantages have been overcome in McCloy's revision.

In 1937 McCloy[5] introduced the Iowa Brace Test composed of twenty-one stunts organized into six batteries of ten stunts each, including ten from the original Brace Test. Batteries of tests for each of the sexes were prepared for the upper elementary school, the junior high school, and the senior high school. Norms were obtained by giving the tests to 335 boys and 424 girls in grades 4 to 12 in the Des Moines public schools. In the present study the performance of the visually handicapped is compared with these norms for the seeing which were published in 1939.[6]

Some of the advantages of the Iowa revision over the original Brace Test are: (1) most of the stunts primarily dependent

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[3]These data are unpublished. Information was obtained by a personal visit to the school in 1949.

[4]D. K. Brace, Measuring Motor Ability (New York: A. S. Barnes Co., 1927). (Out of print.)

[5]C. H. McCloy, "An analytical Study of the Stunt Type Test as a Measure of Motor Educability," Research Quarterly, VIII, 3: 46 (October, 1937).

[6]C. H. McCloy, Tests and Measurements in Health and Physical Education (New York: Appleton-Century-Crofts, 1939), p. 78.

upon strength were eliminated; (2) norms for age and sex are included; (3) two trials instead of one are allowed; and (4) ten instead of twenty tests are administered. Since the revision is almost as reliable as the original test, the time saved in administering it is an important feature.

The development of gross motor coordination in boys and girls as measured by the Brace Test was studied by Espenschade.[7] Sex differences were found to be small before the age of 13.8. Scores for girls showed little change after the thirteenth year but the performance of boys continued to increase in quality. Differences between boys and girls are most marked in agility.

A more recent study by Espenschade[8] is even more pertinent to the present work because it is cross-sectional rather than longitudinal in nature. Norms obtained from two trials on the Brace Tests are presented. This makes possible several comparisons between visually handicapped and seeing pupils.

Track and field skills have long been important in physical education programs. Between 1934 and 1937 a number of achievement scales were prepared to evaluate performance of various groups in track and field. The scales of primary interest here are those for boys and girls in elementary,[9] junior and senior high school.[10] Pupils are classified into several groups on the basis of age, height and weight. The mean for each class is placed at 50, and the 0 and 100 points are three standard deviations from the mean. Norms for seeing children

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[7]Anna Espenschade, Motor Performance in Adolescence, Monographs Society for Research in Child Development, Vol. I (Washington, 1940).

[8]Anna Espenschade, "Development of Motor Coordination in Boys and Girls," Research Quarterly, 18: 1 (March, 1947), pp. 30-43.

[9]N. P. Neilson and F. W. Cozens, Achievement Scales in Physical Education Activities for Boys and Girls in Elementary and Junior High School (Sacramento: California State Department of Education, 1934).

[10]F. W. Cozens, et al., Physical Education Achievement Scales for Boys in Secondary Schools (New York: A. S. Barnes Co., 1936); F. W. Cozens, et al., Achievement Scales in Physical Education Activities for Secondary School Girls and College Women (New York: A. S. Barnes Co., 1937).

are compared with the performance of the visually handicapped tested in the present work.

A hundred years ago Samuel Gridley Howe, a pioneer in the education of the blind in this country, believed that the physical fitness of the blind was below that of children with normal vision. As director of Perkins Institution for the Blind, he wrote in one of his early reports,[11] "The blind are more liable to disease and early death than seeing pupils; partly because there are many cases where blindness is the partial effect of some general cause, which occasions constitutional infirmity, partly because in early life they do not take exercise enough to develop the force of the system; and partly from habits of indolence, physical and mental, acquired in later life." If more attention were paid to the health of the visually handicapped, Howe believed that the mortality of the blind would not differ much from that of the seeing. Shortly before the Civil War, Dr. Howe[12] collected information from seven schools showing that blind students had 10 per cent less power to resist disease.

Another early educator who realized the importance of physical education for the blind was Dr. Campbell,[13] director of the Royal Normal College and Academy of Music for the Blind, London. The gymnasium of the Normal College was considered one of the most complete in all England. Although blind, Dr. Campbell was a leader in the playground movement which spread to the United States about 1906. In 1897 this pioneer wrote,[14] "The education of the blind whether literary, musical, or technical will not be crowned with practical success unless based upon a thorough system of physical education."

About fifty years ago, one of Sargent's early tests was used over a period of years at the Overbrook School for the Blind. After the pupils had exercised for long periods, Sargent's tables for height, weight, and lung capacity were used to reveal improvement in bodily health and strength. In 1897 the school reported[15] that blind boys were 25 per cent and girls 38 per cent below normal.

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[11] Perkins Report (1837), p. 3.

[12] Ibid. (1860), pp. 13-15.

[13] Later Sir Francis Campbell. He was an American trained in an American school for the blind.

[14] Royal Normal College Report (1897), p. 17.

[15] Overbrook Report (1897), p. 23.

Only a few attempts have been made to express exactly the difference in physical performance and skill of blind and seeing children. During the school year 1933-34, Myler[16] gave the Brace Motor Ability Tests to 192 pupils at the Texas School for the Blind. Since it is unlikely that one school is representative of all special schools, the study is of limited value. Furthermore, contradictory statements confuse the reader. Myler wrote "the average motor ability of the two groups (blind boys and blind girls) was about the same as that of corresponding children with normal vision."[17] In another part of the study Myler concludes, "Normal children of various age groups excel the blind of corresponding ages."[18] Another example of confusing statements is as follows: (1) The motor ability of blind boys is superior to that of the seeing.[19] (2) The blind child is rarely ever skillful in handling any part of the body.[20] Myler concludes that the amount of vision has very little correlation with motor ability,[17] but in another part of the study this statement appears, "the greater the amount of vision posessed by the subject, the higher the score on the (Brace) scale.[21] Two more contradictory statements are; (1) "From the data at hand it can not be said whether or not blind children have greater or less difficulty in maintaining balance . . . . . than do normal children,"[22] and (2) "The failures recorded in the various test items involving the act of balancing the body indicate a striking inability on the part of the blind to maintain their balance."[23]

Four fifths of Myler's study is devoted to causes of failure of the visually handicapped in the Brace stunts. The greatest number of failures were due to poor balance, followed in order by failure in coordination and lack of strength.[22] Since this information is not compared with data for seeing children, the reader can not determine whether or not these causes of failure are peculiar to the visually handicapped.

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[16]Pauline Myler, "A Study of the Motor Ability of the Blind," Master's thesis, University of Texas, 1936.

[17]Myler, op. cit., p. 22.

[18]Ibid., p. 34.

[19]Ibid., p. 21.

[20]Ibid., p. 58.

[21]Ibid., p. 35.

[22]Ibid., p. 64.

[23]Ibid., p. 200.

Some of Myler's conclusions are similar to those drawn in the present study. (1) Boys in schools for the blind excel the girls in motor ability.[19] (2) Children with defective vision of the adolescent period excel in motor ability those who are younger.[19] (3) Three trials instead of two on a stunt type test do not improve the performance of the visually handicapped a great deal.[24]

In 1944 Buell[25] introduced the Navy Physical Fitness Test in his work at the Michigan School for the Blind. This test consists of pull-ups, push-ups, sit-ups, squat-jumps and squat-thrusts. The performance of the Michigan blind boys was compared with similar records of boys in two large mid-western high schools. The blind made a creditable showing but were a little below normal in endurance and shoulder strength. After training for a period of thirty-two weeks, the visually handicapped boys had increased their strength and endurance as much as normal boys do in a similar period of time in their physical education classes.

Later Buell[26] extended his study to include 650 boys in twenty special schools. He found that the physical fitness of the blind was a little below that of the seeing. The lowest mean score was in the squat-jump test rather than in pull-ups as reported for the Michigan group. Lack of leg strength seems to be a real weakness of children in schools for the blind. Unfortunately, only means were published and no further statistical treatment was presented.

Buell[27] made two other interesting observations in this study, but no data were presented to verify them. First, the presence or absence of vision showed no consistent relationship to performance in the Navy Physical Fitness Test. In other words, the blind performed as well as did the partially seeing boys. Second, the only records that consistently deviated from the normal in the Navy Test were made by boys from homes with overprotective parents. The present study presents a more scientific approach to these problems.

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[24]Myler, op. cit., p. 129. See also p. 197.

[25]C. E. Buell, "Physical Fitness Testing in a School for the Blind," Outlook for the Blind, December, 1945, pp. 280-82.

[26]C. E. Buell, Sports for the Blind (New York: American Foundation for the Blind, 1947, p. 177.

The writer[28] also compared the performance of the blind with that of the seeing in track and field skills. The records for the blind were obtained from a source which is not entirely representative of all blind children, namely, from the National Athletic Association of Schools for the Blind. According to the present study, these data made the blind appear to achieve more than they actually do in running, jumping, and throwing for distance. Results obtained from the present study indicate that the records of the N.A.A.S.B. are above average and do not accurately represent the motor performance of blind children. One or more of the following statements may explain why these records are above average. Schools with poor physical education programs usually do not enter any interscholastic competition including the National Track Meet. Students who would lower the school's average are sometimes excused. Some schools have been accused of padding their records, which is possible in this type of track meet. The writer believes this is possible, but not very common.

The present study shows beyond doubt that certain track and field achievement scales presented in Sports for the Blind do not accurately represent the performance of visually handicapped children. Most of the earlier work is confirmed by the present more comprehensive study. A different group, large and quite representative of children in schools for the blind, was tested by the writer in the present work. Another feature of this study is the addition of a stunt type test to measure motor performance. This replaces the physical fitness test used in the earlier work.

Most of the other references on the physical education of the visually handicapped are magazine articles based on opinion and emotionalism rather than on an objective approach. Some of the more important references will be found annotated in the bibliography of this study.

Although it is not concerned with physical education, another work should be mentioned here because it is more or less pertinent to the immediate topic. It deals with tests that measure fine motor acts. The best work in aptitude tests for the blind has been done by Bauman,[29] who used the Pennsylvania

[28]Ibid., p. 179.

[29]Mary K. Bauman, "Studies in the Application of Motor Skills to the Vocational Adjustment of the Blind," Journal of Applied Psychology, Vol. 30, No. 2 (1946), pp. 144-54.

Bi-Manual and the Minnesota Rate of Manipulation Tests in her work at the Trainee Acceptance Center in Philadelphia. Bauman found that the norms for the seeing could be used if the blind were given two or three extra trials. Assuming that the blind can achieve normal performance in fine motor acts by a little extra practice, the same tendency might exist in skills involving large muscle groups. With this in mind, the visually handicapped children participating in the present study were given a third trial in the Iowa Brace Tests. Brief consideration is given to the results obtained.

In the field of testing fine motor performance, the New York Institute for the Blind (999 Pelham Parkway, New York City) is doing some aptitude testing and has published two pamphlets on the subject. However, norms have not been established, so the scores are not of much value for vocational guidance. The school promises to make norms available soon.

Chapter II

THE METHOD AND THE SAMPLE

Introduction

This is a normative-survey study with some consideration given to causal relations. A battery of tests involving gross motor performance was given to a large representative group of blind and partially seeing children. Mean performances of the visually handicapped are compared with norms established for seeing children by McCloy,[1] Espenshade,[2] Neilson,[3] and Cozens.[4] Performances of various parts of the larger group are compared by obtaining means, standard deviations, probable errors, and significant differences between means. Attention is given to the relationships between performance and the amount of vision, the length of visual handicap, and the attitude of parents toward their children whose vision is defective.

In the United States there are approximately 6,000 blind and partially seeing children attending the sixty residential schools for the blind and the Braille classes in twenty-five cities. Since these schools are located hundreds of miles apart, it is difficult to learn what others in the field are doing. Because of this obstacle, research in the education of the visually handicapped has been limited.

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[1] C. H. McCloy, Tests and Measurements in Health and Physical Education (New York: Appleton-Century-Crofts, 1942).

[2] Anna Espenschade, "Development of Coordination in Boys and Girls," Research Quarterly, 18: 1 (March, 1947), pp. 30-43.

[3] N. P. Neilson and F. W. Cozens, Achievement Scales in Physical Education Activities for Boys and Girls in Elementary and Junior High Schools (New York: A. S. Barnes Co., 1939).

[4] F. W. Cozens et al. Physical Education Achievement Scales for Boys in Secondary Schools (New York: A. S. Barnes Co., 1936); ibid., Achievement Scales in Physical Education Activities for Secondary School Girls and College Women (New York: A.S. Barnes Co., 1937).

The writer spent six weeks gathering the data for the present study. He tested 865 pupils in twelve residential schools, and eight Braille classes in two large cities. All the testing and scoring were done by the investigator. This eliminated an important weakness found in most survey studies of the visually handicapped. In studies conducted by mail the quality of judging and leniency of scoring may vary from school to school.

Selection of Tests

From a survey of the literature (Chapter I) it is obvious that no one test provides an adequate measure of motor performance nor has any test battery demonstrated general superiority. It is assumed that the only way to obtain a significant measure of motor performance is to employ a variety of measures.

Track and field events with reliability coefficients of more than .80 offer a useful approach to testing gross motor performance. McCloy[5] has shown that it matters little which specific events are used as long as they are well balanced among a run, a broad jump, a high jump, and a weight throw. The high jump is the least important of the four.

After using a battery of motor tests, Espenschade[6] reported that the most reliable were the distance throw, standing broad jump, and the Brace Test. The study also revealed that the Brace Test correlated more highly with fine motor performance than did track and field events. Apparently the stunt type test measures important factors in motor performance not evaluated by other events.

Some of the more important factors in motor performance are endurance, strength, coordination, speed, agility, and body control. By sampling most of these abilities, the present study attempts to obtain a significant measure of gross motor performance. Consideration must go beyond objectivity of tests to considerations of time, space and equipment. The tests must be interesting and applicable to both sexes over a wide age range. To test the blind and partially seeing, events must be chosen which will fairly measure their performance.

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[5]C. H. McCloy, The Measurement of Athletic Power (New York: A. S. Barnes Co., 1932).

[6]Anna Espenschade, Motor Performance in Adolescence, Monographs Society for Research in Child Development, Vol. I (Washington, 1940), p. 20.

The testing program administered by the investigator included:

1. Fifty yard dash (speed of legs)
2. Standing broad jump (leg strength and flexibility)
3. Basketball throw for distance (arm and shoulder-girdle coordination)
4. Iowa Brace Test (coordination, agility, and control of body)

The Iowa Brace Test was selected rather than the Brace Test because it offers some practical advantages in administration. The greatest advantage of the Iowa revision over the original test is that ten instead of twenty tests are administered. Since little is lost in objectivity, the time saved in administering the shorter test is an important feature. The Iowa Brace Test is considered by most physical educators to be almost as reliable a measure of motor performance as the Brace Test.

Administration of the Iowa Brace Test

The Iowa Brace Test includes six batteries of ten stunts each. Batteries of tests have been prepared for each of the two sexes for the upper elementary school, the junior high school, and the senior high school. A full description of the Iowa Brace Test will be found in Appendix K.

One modification in administering the Iowa Brace Tests was introduced. After the usual two trials had been given, a third trial was scored separately. In one further trial it was hoped to determine whether or not the visually handicapped could attain the norms of the seeing. The tests were given to groups of not more than eight pupils at a time. In cases where the explanation alone was not sufficient, the investigator placed the pupil's limbs in the proper position. In some cases the writer allowed the blind to feel the position of his body. Using these methods, eight to ten pupils were tested within a forty minute period.

The teachers at each school had aroused the pupils' interest shortly before the investigator arrived to give the tests. The children found it interesting to be excused from school to perform for a teacher from another school for the blind. Thus, motivation was probably fairly constant from pupil to pupil and from school to school. The lack of motivation was not a serious problem in the testing program.

Track and Field Events

Two trials were given to each pupil in the 50 yard dash. Only one child performed at a time. Guide wires were available for about three-fifths of the pupils. Although the other blind boys and girls ran without wires, they were not at a serious disadvantage, because the instructor blew a whistle at the finish line. It has never been clearly shown that guide wires are essential for a blind child to attain his maximum speed in running. In fact, some blind runners prefer to perform without the wire because they obtain more speed. When blind children race with others, guide wires are an asset because they keep the runner in his lane, avoiding accidents.

Three trials were given each pupil in the standing broad jump and the basketball throw for distance. The distance jumped was measured from the take-off board to the nearest point on the ground touched by any part of the body. Distances were measured to the nearest inch. The basketball throw was measured to the nearest foot. In these events the usual procedures were followed, including loss of trials for fouls.

The testing program was carried on under a variety of conditions. Some pupils had the opportunity to perform under better conditions than did others. Every effort was made to equalize conditions as far as possible. All pupils were given a reasonable opportunity to show what they could do. This included the pupils in the Braille classes in the public schools where conditions were not exactly ideal.

The administrator of each school assigned a member of his staff to give the writer limited assistance. Most of this service consisted of making pupils available at the proper time and place and dressed for the occasion.

Pupils with severe handicaps in addition to blindness were excused from the tests. Those who were crippled or who had weak hearts formed the majority of cases in this group. Some schools excused a larger percentage of pupils than did others, but no control could be exercised over this practice. In the great majority of schools, at least 90 per cent of the boys and girls over ten years of age took part in the testing program.

Background Information.

Information ooncerning the height, weight, and age of pupils was obtained from school records. A few subjects were weighed and measured at the time of the tests, and this procedure was

followed for all of the boys in the Colorado School for the Blind. The presence or absence of useful vision was determined by questioning the pupils at the time they took the tests. This procedure was also used to obtain the information on length of visual handicap. During the questioning of students, a member of the school staff was usually present in an attempt to check the accuracy of pupils' answers. For purposes of the present study, the information obtained in this manner had sufficient accuracy. The procedure of questioning pupils, rather than consulting school records, saved much valuable time and little was lost in reliability. In many cases the school records lacked the desired information, particularly the length of the visual handicap. Therefore, it was necessary to sometimes question pupils for further information. For example, a pupil listed as a "light perception" case was in the best position to know whether or not his limited vision was useful to him.

Members of the staff were asked to give information concerning the attitude of parents toward their visually handicapped children. Some of them were qualified to do this because they had talked with parents who visited the school. The reading of letters to pupils by staff members, a common practice in residential schools for the blind, contributed to understanding parental attitudes. Similar information can be obtained by observing pupils perform in the dining room and dormitory. Usually at least one member of the school staff has some information about a child's home life. Since Perkins Institution and the Michigan School for the Blind employ social workers, about 25 per cent of the children were rated by very competent personnel.

In all of the schools the investigator conferred with houseparents, teachers, superintendents, or social workers regarding the pupils taking the tests. In these conferences many cases of neglected children were mentioned. Therefore, some consideration is given to them in this study. However, the primary aim of these conferences was to discover cases of overprotection.

Authorities in Kentucky and West Virginia had little information on some of their pupils because they came from isolated mountain communities. At these schools the writer asked the pupils two questions and then rated them as protective or nonprotective cases. First, "Do your parents permit you to go alone to the store or to your friend's home?" Second, "What are you going to do at home this summer?"

These are rather crude methods for discovering over-protected children. However, the results of the present study show that the performances of the pupils thus singled out differed significantly from those of the rest of the group.

The nature of the physical education programs in the schools was revealed by a questionnaire prepared for the purpose. During an interview with the physical education teachers of each school, the investigator filled in the questionnaire (Appendix A).

The Sample

In a study of this type it is important to describe fully the source of data. There are some good reasons for this. (1) The schools are very widely scattered. (2) The physical training of the visually handicapped varies a great deal from school to school. (3) The public is not acquainted with blindness and the factors surrounding it.

In the spring of 1949 the writer sent an outline of the present study to most of the schools and special classes for the blind. A request for permission to visit the school and give the tests was made. A favorable reply was received from twenty schools. From his previous experience in the education of the blind, the writer was able to prepare an itinerary which would include visits to fourteen schools which appeared to be representative of the entire group of sixty. Unfortunately, only one school for the Negro blind could be included, and it is not representative of the fifteen segregated schools in this group. The Alabama School for the Negro Blind has never offered physical education in its curriculum.[7] Two-thirds of the schools for the Negro blind offer organized programs of physical activities.[8] However, these programs are much more restricted than the physical education found in schools for white blind pupils.

Besides the Alabama School for the Negro Blind, other residential schools which took part in the study are Alabama, California, Colorado, Connecticut, Kentucky, Michigan, New York

[7]This school will have a physical education program beginning in the fall of 1949.

[8]Charles E. Buell, The Education of the Negro Blind in the United States (published master's thesis [New York: American Foundation for the Blind, 1945]), p. 43.

(Batavia), Perkins, Virginia, Washington, and West Virginia. Four Braille classes in Detroit and four in New York City were visited and their results were combined into two groups. This investigation is one of the few studies that gives representation to the pupils in the Braille classes of the public schools and the Negro blind children. Of the 6,000 visually handicapped children attending special schools, approximately 600 are Negroes and about 600 attend Braille classes in public schools.

A total of 865 children (519 boys and 346 girls) was tested in May and June of 1949. The pupils ranged in age from ten to twenty years. The age distribution is listed in Table I.

TABLE I

Number of Visually Handicapped Pupils at Each Age

Age	Number of boys	Number of girls
10	47	36
11	56	36
12	54	38
13	66	40
14	57	35
15	58	37
16	49	25
17	46	35
18	28	26
19	31	20
20	27	18
Total	519	346

It is evident that the pupils taking part in the testing program were fairly distributed over the age range 10-20 years. The older pupils in a group taking a battery of Iowa Brace Tests usually score somewhat higher, because they pass one or two more stunts. If the majority of the visually handicapped students had fallen at one end of the age distribution, it would have been difficult to interpret results of the tests in terms of the norms established for seeing children. These norms are based on performances of children whose ages are evenly distributed over a range of three or four years.

Due to the educational lag of blind children,[9] age rather than academic grade was used to classify the pupils into elementary, junior high, and senior high groups for the Iowa Brace Test. Pupils were classified thus:

Elementary . . . . . ages 10, 11, and 12.
Junior high . . . . . ages 13, 14, and 15.
High school. . . . . all over 16

About 78 per cent (4,700) of the population of 6,000 children in schools for the blind is above ten years of age. Of these 4,700 pupils over ten years of age, 865 (18 per cent) participated in the present study. Thus, more than one-sixth of the entire population was tested.

Blind pupils comprise 36 per cent of the entire group of children in the study. Other investigators have found about the same proportion of blind pupils in schools for the blind. In this respect, the sample of the present study appears to be representative of the entire population. Classified as over-protective, were 27 per cent of the blind and 11 per cent of the partially seeing. One-fourth of the blind lost their vision after six years of age.

It was found that 87 per cent of the pupils had been in special classes for at least three years. A total of 53 per cent had attended for at least six years, and 26 per cent had been present for nine years or more. Most of the pupils participating in the study had been in the environment of special education for several years.

The sample used in this study was selected carefully and appears to represent the total population in schools for the blind, but one cannot be certain that this is the case.

[9]S. P. Hayes, Contributions to a Psychology of Blindness (New York: American Foundation for the Blind, 1941). p. 233.

Chapter III

PHYSICAL EDUCATION PROGRAMS FOR THE VISUALLY HANDICAPPED AND THEIR INFLUENCE UPON MOTOR PERFORMANCE

The information for the survey of the physical education programs offered by the schools participating in the present study was obtained from interviews with the teachers. The programs are presented here for two reasons: first, to show that the sampling is representative of all schools for the blind (this can be checked by referring to Buell's[1] comprehensive work in this field); second, to determine what general relationships might exist between training and motor performance.

For various reasons, some schools do not have full representation in Tables II and III. There is no organized physical education in the New York and Detroit Braille classes. The lack of a physical education program in the Alabama School for the Negro Blind has already been referred to. The girls in West Virginia do not have physical education. In Colorado the girls did not take part in the study because they were away at a week-end camp during the writer's visit to Colorado Springs.

In Tables II and III the amount of time spent on physical education activities is shown. Physical educators usually devote more time to those activities which they believe are most valuable. Each school was asked to name five or six activities that were considered to be the most important for each age group. These activities are marked "X" in the tables. Other activities which were offered are indicated by "O".

Effect of Training in Physical Activities Upon Motor Performance

Several factors besides training in physical activities are important in motor performance. Some of these are age, height, weight, and general maturation. In another part of this study, evidence is presented which shows that a significant relationship

[1]Charles E. Buell, Sports for the Blind (New York: American Foundation for the Blind, 1947), pp. 38-46.

TABLE II

GIRLS' PHYSICAL EDUCATION

		Minutes per week	Games, relays	Tumbling	Folk dancing	Calisthenics	Corrective	Apparatus	Marching tactics	Track and field	Softball	Swimming	Bowling
Elementary	Alabama	300	O			X	O				O		
	California	90	X		O	X				O		O	
	Connecticut	120	X	O		X	O	X		O			O
	Kentucky	220	X			X		X	X	X			
	Michigan	150	X	X	X	X							
	Batavia, N.Y.	120	X	O	X	X	X	O	X	X	O	O	
	Perkins	90	X	X			O	X			X		
	Virginia	300	X	X	O	O	X			O		X	O
	Washington	120	X				O		O				
Junior High	Alabama	300	O			X	O				X		
	California	90	X	O		X				O		O	
	Connecticut	160	O	O		X	O	X	O	O			O
	Kentucky	220	X			X		O	X	X			
	Michigan	150	X	X	X		O	X		O		O	
	Batavia, N.Y.	120	X	O	X	O	O	X	O	X	O	X	
	Perkins	120	X	X	X	O		O			X	X	O
	Virginia	300	X	X	O	O	O			X		X	O
	Washington	120	X				O	O					
High School	Alabama	300	O			X	O				X		
	California	90	X	O		X				O		O	
	Connecticut	160	O	O		X	O	X	O	O			O
	Kentucky	220	X			X		O	X	X			
	Michigan	225	O	X	X		O	X		X	O	O	O
	Batavia, N.Y.	120	X	O	X	O	O	X	O	X	O	X	
	Perkins	120	O	X	X	X	O	O		O	X	X	O
	Virginia	300	X	X	O	O	O			X		X	
	Washington	120	X				O		O				

TABLE III

BOYS' PHYSICAL EDUCATION

		Minutes per week	Games, relays	Tumbling	Calisthenics	Corrective	Apparatus	Marching tactics	Track and field	Softball	Football	Wrestling	Swimming	Bowling
Elementary	Alabama	300	O		X	O		X	O	X		O		
	California	180	X	O	X				X	X	O	O	X	
	Colorade	60		O	X			X	O					
	Connecticut	120	X	O	X	O	X	O	X	O	O	X	O	
	Kentucky	250	X	O	X	O		X	X			X		
	Michigan	150	X	X	X	O	X	X	O	O	O	O	O	
	Batavia, N.Y.	120	X	O	X	O	O	X	X	O		O	X	
	Perkins	90	X	O		O	X			X				
	Virginia	150	X	X	X	O	O	O	X	O			X	O
	Washington	120	X	O		O			X	X	O	O		
	W. Virginia	150	X	O	X	O	O		X	O	O	O		O
Junior High	Alabama	300	O		X	O		X		X	X			
	California	225	X	O	X				X	X	O	X	X	
	Colorado	60	O	X	X		X	X	O					
	Connecticut	200	O	O	X	O	X	O	X	O	O	X	O	O
	Kentucky	300		X	X	O		X	X			O		
	Michigan	150	X	X		O	X	O	O	X		O	O	
	Batavia, N.Y.	120	X	O	O	O	X	O	X	O		O	X	
	Perkins	120	X	O	O	O	O		X	X	O	X	X	O
	Virginia	250	X	X	O	O	O	O	X	O	O	X	X	O
	Washington	120	X	O		O			O	X	O	X		
	W. Virginia	225	X	O	O	O			X	O	O	X		O
High School	Alabama	300	O		X	O		X		O	X			
	California	250	O	O	X				X	X	O	X	X	
	Colorado	60		X	X	O	X	X	O		O			
	Connecticut	220	O	O	X	O	X		X	O	O	X	O	O
	Kentucky	300		X	X	O		X	X			X		
	Michigan	250	O	X	X	O	X		O	O	X	X		
	Batavia, N.Y.	120	X	O	O	O	X	O	X	O		O	X	
	Perkins	120	O	O	O	O			X	X	X	X	X	O
	Virginia	250	X	X	O	O	O		X	O	O	X	X	O
	Washington	120	X	O		O		O	O	X		X		
	W. Virginia	225	X	O	X	O	O		X	O	O	X		O

exists between motor performance and each of three factors--amount of vision, duration of visual handicap, and attitude of parents toward their children with defective vision.

The average scores for the various schools in the Iowa Brace Test and the track and field events are shown in Tables IV and V. The scores in Table V were obtained from achievement scales in track and field events prepared for the visually handicapped by Buell.[2] These achievement scales are rather similar in form to those of Neilson and Cozens which were briefly described in Chapter I.

The data in Tables IV and V are primarily descriptive in nature. In general, they show how well the pupils in each school performed. However, a few observations can be made. All schools with the highest scores have organized programs of physical education under experienced teachers. On the other hand, the schools without physical education in the curriculum fall below the average in most events. Most of the difference exists at the junior and senior high school levels where pupils' training, or lack of it, has accumulated over a period of several years.

There seems to be some relationship between training and performance in running and jumping, but this does not exist for throwing. Although Alabama, Michigan, Colorado, and Washington have organized programs of physical education, they do not feature track and field events. In comparison with the entire group of high school boys, forty-nine boys in these schools scored lower in the jump and the dash, but the mean score for both groups was 42 in the throw. The difference between mean scores of the two groups was five points (44, 49) in the dash and eight points (36, 44) in the jump. While the difference between the means in the dash is not significant, it attains the .05 level of significance in the jump.

There appears to be little relationship between training in tumbling and scores on the Iowa Brace Test. Four schools featuring tumbling are Virginia, Michigan, Kentucky, and Colorado. The mean score on the Iowa Brace test for sixty-four junior high boys in these schools was 13.5 as compared with a mean score of 13.2 listed in Table IV for the entire group. On the high school level, the difference in mean scores is only a little greater. The entire group scored 12.6 while sixty boys in schools featuring tumbling scored 13.7

[2]Buell, op. cit., pp. 195-219

TABLE IV

AVERAGE SCORES ON IOWA BRACE TESTS FOR VARIOUS SCHOOLS

Scores for Boys

School	Elementary		Junior High		High School	
	No. of boys	Mean score	No. of boys	Mean score	No. of boys	Mean score
A	5	12.4	9	12.2	11	9.6
B	16	11.0	14	11.4	17	14.6
C	23	10.8	21	13.9	17	13.2
D	7	9.4	13	13.8	9	13.9
E	2	8.0	6	13.8	7	10.1
F	3	10.7	5	13.8	4	7.8
G	16	9.1	14	12.4	12	13.1
H	22	12.1	20	15.3	23	14.3
I	8	14.1	13	13.0	24	12.3
J	5	11.8	8	12.4	1	14.0
K	18	9.2	22	12.8	21	12.5
L	21	9.9	17	12.3	16	13.3
M	2	12.5	10	14.1	4	15.8
N	9	9.4	9	11.9	15	12.5
Means		10.57		13.2		12.8

Scores for Girls

School	Elementary		Junior High		High School	
	No. of girls	Mean score	No. of girls	Mean score	No. of girls	Mean score
A	7	7.0	6	9.7	6	8.2
B	8	12.9	13	13.4	16	11.1
C	8	7.1	13	9.5	9	7.8
D	1	12.0	3	9.3	5	10.6
E	2	15.0	3	12.7	2	12.5
F	8	7.0	10	10.3	11	7.2
G	20	8.1	8	10.9	20	10.0
H	8	8.6	13	10.4	15	9.0
I	11	10.1	5	9.6	0	
J	15	9.1	16	10.3	21	9.0
K	9	8.2	11	10.2	7	10.3
L	2	11.5	6	14.3	5	11.4
M	11	6.1	5	9.6	7	7.4
Means		8.63		10.4		9.35

TABLE V

AVERAGE SCORES FOR VARIOUS SCHOOLS IN TRACK AND FIELD EVENTS

Scores for Boys

School	DASH El†	DASH JH†	DASH HS†	THROW El	THROW JH	THROW HS	JUMP El	JUMP JH	JUMP HS
A	37	38	37	40	35	37	25	28	23
B	44	59	59	36	44	41	19	36	39
C	54	66	56	43	58	45	59	59	52
D	44	45	50	44	50	41	33	31	39
E	40*	48	54	36*	38	20	39*	43	48
F	14*	31	53	10*	28	12	16*	38	20
G	15	53	54	27	45	39	29	59	53
H	19	47	48	37	46	44	19	34	40
I	25	52	51	36	50	44	46	54	47
J	40	47	22*	46	34	40*	39	17	10*
K	18	30	49	35	41	47	30	39	47
L	21	50	56	32	31	34	26	39	40
M	38*	45	41	41*	59	43	28*	43	42
N	33	45	46	41	40	34	47	40	48
Means	31	48	49	36	45	42	33	43	44

Scores for Girls

School	DASH El	DASH JH	DASH HS	THROW El	THROW JH	THROW HS	JUMP El	JUMP JH	JUMP HS
A	39	32	38	34	32	22	40	24	41
B	46	48	51	37	33	35	61	41	55
C	40	45	36	42	44	30	56	52	41
D	28*	51*	47	35*	37*	44	65*	22*	52
E	47*	53*	60*	50*	32*	20*	70*	58*	20*
F	42	65	43	33	28	24	74	66	46
G	27	30	28	36	29	26	33	45	35
H	32	33	48	41	35	36	69	48	57
I	34	29		40	28		26	18	
J	18	31	45	34	34	29	30	37	52
K	33	26	36	33	30	32	50	34	49
L	30*	33	36	40*	40	34	62*	58	48
M	5	21	41	37	30	24	18	20	38
Means	32	39	42	34	35	31	41	50	45

*Less than five boys or four girls in group.

†El = Elementary; JH = Junior High; HS = High School

In Chapter IV the visually handicapped are scored on track and field achievement scales for seeing children. On these scales scores are equivalent for younger and older children because age, weight, and height are held constant. It is just as difficult for one group to achieve a certain score as it is for the other. The mean scores of older children in schools for the blind more nearly approach the norms for the seeing than do the mean scores of younger visually handicapped children. It would appear that physical education in schools for the blind is partly responsible for this change in mean scores on achievement scales.

Chapter IV

COMPARISON OF VISUALLY HANDICAPPED AND SEEING PUPILS IN TRACK AND FIELD

Basis of Comparison

The achievement scales constructed for seeing boys and girls can be used to compare performances of visually handicapped children with those of normal pupils. These scales have been generally accepted by physical educators as valid measures of performance in track and field. Before achievement scales can be used, pupils must be classified according to age, height and weight. This is done by using a classification chart listing exponents for these three factors. For example, a sum of exponents from 10 to 14 places a child in Class B in one system of classifying boys and girls. On achievement scales the mean for each class is 50, and 0 and 100 are three standard deviations from the middle of the scale. The scores of various classes are equivalent. For example, a score of 43 in the basketball throw is just as difficult to achieve in Class A as it is in Class E. The score in one event is considered to be equivalent to that in another. In other words, the possibility of scoring 75 points is the same for the standing broad jump and for the 50 yard dash; also scale scores for the boys and the girls, and for the elementary and secondary levels, are equivalent. The information presented in this paragraph is the basis for several comparisons made in the present study.

Classification charts and achievement scales prepared for seeing children were used to classify and score the visually handicapped boys and girls. Tables VI and VII compare the performances of visually handicapped and seeing children in running, jumping, and throwing. The events are the 50 yard dash, the standing broad jump, and the basketball throw for distance. For two reasons, classes are combined to form larger groups to work with in this part of the present study. First, the number of visually handicapped children in some of the classes was rather small which increased the possibility of obtaining unreliable statistical results. Second, if the results

TABLE VI

COMPARISON OF VISUALLY HANDICAPPED AND SEEING BOYS IN TRACK AND FIELD
(Combined classes, Cozens' classification: Elementary, Classes A, B, C, D, E*; Secondary, Classes A, B, C, D**)

School Level and Activity	Visually Handicapped		Seeing			
	M_v	SD	M_s	SD	M_v-M_s	CR
Elementary						
Dash	31.9	24.83	50.0	16.67	18.1	9.58
Throw	26.9	22.97	50.0	16.67	23.1	12.98
Jump	41.6	23.90	50.0	16.67	8.4	4.59
Secondary						
Dash	46.2	24.58	50.0	16.67	3.8	2.32
Throw	24.1	20.57	50.0	16.67	25.9	17.99
Jump	53.5	22.58	50.0	16.67	-3.5	-2.27

*N. P. Neilson and F. W. Cozens, Achievement Scales in Physical Education Activities for Boys and Girls in Elementary and Junior High School (New York: A. S. Barnes Co., 1939).

**F. W. Cozens et al., Physical Education Achievement Scales for Boys in Secondary Schools (New York: A. S. Barnes Co., 1936).

There are 400 seeing children in each of the elementary and secondary groups. Data presented for the visually handicapped are based on distribution tables in Appendix B: 214 elementary and 304 secondary boys.

Mean scores refer to scores on achievement scales.

TABLE VII

COMPARISON OF VISUALLY HANDICAPPED AND SEEING GIRLS IN TRACK AND FIELD
(Combined classes, Cozens' classification: Elementary, Classes A, B, C, D; Junior High, Classes E, F, G*; High School, 16 years and over**)

School Level and Activity	Visually Handicapped		Seeing			
	M_v	SD	M_s	SD	$M_s - M_v$	CR
Elementary						
Dash	22.8	19.77	50.0	16.67	27.2	12.91
Throw	31.8	15.72	50.0	16.67	18.2	10.40
Junior High						
Dash	24.8	21.00	50.0	16.67	25.2	11.89
Throw	18.5	14.90	50.0	16.67	31.5	18.00
High School						
Dash	32.1	22.63	50.0	16.67	17.9	8.21
Throw	26.5	16.61	50.0	16.67	23.5	13.82
Jump	43.5	24.12	50.0	16.67	6.5	2.80

*N. P. Neilson and F. W. Cozens, Achievement Scales in Physical Education Activities for Boys and Girls in Elementary and Junior High School (New York: A. S. Barnes Co., 1939).

**F. W. Cozens et al., Achievement Scales in Physical Education Activities for Secondary School Girls and College Women (New York: A. S. Barnes Co., 1937).

Data presented here are based on distribution tables in Appendix C. The number of girls in each group of visually handicapped children is as follows: Elementary, 104; Junior High, 116, and High School, 126.

Scores in the jump are not listed for the elementary and junior high school girls because achievement scales have not been prepared for seeing girls at these levels.

Mean scores refer to scores on achievement scales.

for individual classes are considered separately, differences of about the same magnitude are obtained again and again. This can be confirmed by using the distribution tables in Appendices B and C and performing the required mathematical computations. Since little was to be gained by duplicating results and much time would have been consumed, the classes were not treated separately but combined into larger groups.

Information on the number of seeing children in each class is unavailable. Performances of at least 130 children were used for developing the achievement scales for each class in each track and field event. Since the exact number of seeing children in each class was unknown, it was necessary to estimate the number in the groups in Tables VI and VII. Each group was conservatively estimated to consist of 400 seeing children because it included three or more classes.

Results of the Comparison

The visually handicapped fall far below the norms for the seeing, in most events. Most of the differences are significant far beyond the .01 level. Significant, almost at the .02 level, is the difference between visually handicapped and seeing secondary boys in the 50 yard dash. The blind and partially seeing perform better in only one event, and this is the standing broad jump for high school boys. The difference is significant at the .03 level.

There are many factors contributing to the difference between the blind and seeing in track and field. Many parents do not permit their visually handicapped children to run or to climb or throw things as other children do. Blind children may not experience as strongly the urge, so natural to seeing children, to run and throw objects. A blind child may have these urges, but lack of vision may hinder him from satisfying them in full. Some students without vision seem to have a fear of injury that might result from moving about rapidly. Another factor is that the blind do not have as much muscular strength as the seeing.[1] These seem to be the more important factors, but there may be others.

In all probability the reason that the visually handicapped high school boys excel seeing boys in the standing broad jump is that they are more familiar with this event and have had

[1]Charles E. Buell, Sports for the Blind (New York: American Foundation for the Blind, 1947), pp. 176-77.

more training in it. The standing broad jump is used in schools for the blind because it offers no handicap to the boys and girls. Seeing boys usually compete in the running broad jump.

Relationships Among Performances of Visually Handicapped Children in Running, Jumping, and Throwing

Track and field achievement scales for seeing children are constructed so that scores are comparable from event to event. When performances of the visually handicapped are scored on achievement scales for seeing children, mean scores differ significantly from event to event. For the visually handicapped, the scores on these achievement scales are not comparable because it is more difficult for a blind boy or girl to achieve a certain score in one event than in another. In comparison with the seeing, the performance of the visually handicapped differs from event to event.

Some of the relationships among performances of the visually handicapped in throwing, running, and jumping are shown in Tables VIII and IX. The tables are largely a rearrangement of data presented in Tables VI and VII. The scores in all four tables were obtained by scoring performances of the visually handicapped on track and field achievement scales constructed for seeing children. Table VII shows that three of the four visually handicapped groups perform significantly better in the dash than in the basketball throw for distance. As shown in Table IX, the performances of the visually handicapped in the standing broad jump excel those in the 50 yard dash. Data in Tables VIII and IX indicate that visually handicapped children score much higher in the standing broad jump than in the distance throw. All of these differences are significant at the .05 level, and the differences between the dash and the jump exceed the .01 level. Although the differences between the throw and the jump are not listed, it is evident that they are significant beyond the .01 level for three of the four visually handicapped groups listed in Table VIII. Whether or not this same difference exists between performances in throwing and jumping for elementary visually handicapped girls is not known.

Those not familiar with the blind might assume that the fear of injury would prevent them from performing as well in the 50 yard dash as in throwing a basketball for distance. From observation, the writer has noticed that blind girls are

TABLE VIII

COMPARISON OF PERFORMANCES OF VISUALLY HANDICAPPED CHILDREN IN RUNNING AND THROWING*

		DASH		THROW			
	N	M_d	SD	M_t	SD	M_d-M_t	CR
Elementary boys	215	31.9	24.84	26.9	22.97	5.0	2.17
Elementary girls	104	22.8	19.77	31.8	15.72	-9.0	-3.63
Secondary boys	304	46.2	24.58	24.1	20.57	22.1	12.01
Secondary girls	126	32.1	22.63	26.5	16.61	5.6	2.24

*Mean scores in this table were obtained by scoring performances of visually handicapped children on track and field achievement scales constructed for seeing boys and girls.

TABLE IX

COMPARISON OF PERFORMANCES OF VISUALLY HANDICAPPED CHILDREN IN JUMPING AND RUNNING*

		JUMP		DASH			
	N	M_j	SD	M_d	SD	M_j-M_d	CR
Elementary boys	215	41.6	23.90	31.9	24.84	9.7	4.13
Secondary boys	304	53.5	22.58	46.2	24.58	7.3	3.80
Secondary girls	126	43.5	24.12	32.1	22.63	11.4	3.86

*Mean scores in this table were obtained by scoring performances of visually handicapped children on track and field achievement scales constructed for seeing boys and girls.

Note: Achievement scales have not been constructed for elementary seeing girls in the standing broad jump. Thus, this event cannot be included in the comparisons made here for visually handicapped girls.

usually more restrained than boys without vision. Fear of injury is undoubtedly a handicap to many blind runners. However, much of this is overcome in most schools for the blind. The guide wires available in many special schools permit blind boys and girls to run rapidly without fear. It is true that the freedom of the arms is reduced somewhat, and the runner is slightly hindered. When the blind run without wires they have a tendency to weave back and forth, and time is lost. Even when all fear is overcome, seeing children have an advantage in running.

In comparing the running and throwing performances of the blind, the writer believes that a factor other than fear is most important. Visual clues seem to be very helpful in learning the correct form in throwing a ball for distance. Another factor of much less importance is the lack of shoulder strength usually found in blind children.[2] Those who have made many attempts to teach form in track and field to the blind have found that throwing is the event in which it is extremely difficult to achieve satisfactory results.

Since vision is probably not important in aiding one to do well in the standing broad jump, the visually handicapped perform better in this event than in running. From his experience, the writer believes that visual clues are not essential in giving instruction in jumping form to children with defective vision.

Relationship Between Length of School Attendance and Performance of Visually Handicapped Children in Track and Field Events

Most of the data in Table X are based upon information contained in Tables VI and VII, but they are arranged to show different comparisons. In all of these tables the performances of the visually handicapped are listed as mean scores. These scores were obtained from track and field achievement scales constructed for seeing children. Visually handicapped secondary school boys and girls excel their elementary schoolmates in running and jumping. The mean scores of older children in schools for the blind more nearly approach the norms for the seeing than do the mean scores of younger visually handicapped children. In the standing broad jump and running the 50

[2] Buell, op. cit., p. 177.

yard dash, these differences are significant at the .001 level for boys and girls. In throwing for distance, elementary girls perform significantly better than do secondary girls at the .02 level. Elementary boys appear to perform somewhat better in the distance throw than do secondary boys, but the difference between the mean scores of the two groups does not attain the .10 level of significance.

As they grow older, visually handicapped girls do not improve as much in throwing as do seeing girls. When scored on achievement scales for seeing children, the mean score of older girls in schools for the blind falls significantly below the average score for younger visually handicapped girls. There is also a tendency for achievement scale scores of older

TABLE X

TRACK AND FIELD PERFORMANCES OF THE VISUALLY HANDICAPPED COMPARED ON THE ELEMENTARY AND SECONDARY SCHOOL LEVELS*

	Elementary			Secondary				
Event	N	M_e	SD	N	M_s	SD	$M_s - M_e$	CR
Boys								
Dash	215	31.9	24.84	304	46.2	24.58	14.3	6.50
Throw	215	26.9	22.97	304	24.1	20.57	-2.8	-1.43
Jump	215	41.6	23.90	304	53.5	22.58	11.9	5.72
Girls								
Dash	104	22.8	19.77	126	32.1	22.63	9.3	3.32
Throw	104	31.8	15.72	126	26.5	16.61	-5.3	-2.43

*Mean scores in this table were obtained by scoring performances of visually handicapped children on track and field achievement scales constructed for seeing boys and girls.

visually handicapped boys to fall somewhat below those of their younger schoolmates. This lag of the visually handicapped in throwing is probably due to the difficulty of acquiring the proper muscular movements.

In running and jumping, the visually handicapped make a significant improvement between the elementary and high school levels. The school environment, particularly the physical education program, is perhaps the basic factor in bringing about the improved performance. In schools for the blind, pupils are

expected to take an active part in games and sports. For many blind boys and girls, this is an entirely new outlook on life. Before coming to school, many of them had limited activities, due to the overprotective attitude of the parents.

Visually Handicapped Boys' Performances Compared With Those of Girls in Track and Field

When performances are scored on achievement scales for seeing children, the mean scores in running and jumping for visually handicapped boys more nearly approach the norms for the seeing than do the average scores of girls with defective vision. The differences between the mean scores of the visually handicapped boys and girls in these two events are significant at the .01 level. On the other hand, in throwing, the mean scores of the visually handicapped girls more nearly approach the norms of the seeing. In throwing, the difference between the mean scores of the visually handicapped elementary boys and girls is significant at the .05 level. These comparisons of visually handicapped boys' and girls' performances are shown in Table XI.

Some of the reasons why the performances of the visually handicapped boys more nearly approach the norms for the seeing than do those of girls with defective vision are: (1) special schools usually provide better physical education programs for boys than they do for girls, (2) the boys are usually given more athletic equipment and permitted to use more playground area, and (3) more time is devoted to boys' physical activities classes than to those for girls. Then, too, visually handicapped boys are generally more active than girls. Just why the girls should make better scores on the achievement scales for throwing is not clear. Since seeing girls do not throw a basketball very far, it may be easier to approach these norms.

Reliability of Track and Field Events for the Seeing and the Visually Handicapped

Most studies have reported reliability coefficients of .80 or higher for the seeing in various track and field events, but little is known about the results of repeating such tests on the same groups of pupils in schools for the blind. In Table XII, pertinent information from three studies on the seeing is compared with reliability coefficients for the visually handicapped. In the California and West Virginia schools for the blind, a

TABLE XI

VISUALLY HANDICAPPED BOYS' TRACK AND FIELD PERFORMANCES COMPARED WITH THOSE OF GIRLS WHOSE VISION IS DEFECTIVE

	Boys			Girls				
Event	N	M_b	SD	N	M_g	SD	$M_b - M_g$	CR
DASH								
Elementary	215	31.9	24.84	104	22.8	19.77	9.1	3.54
Secondary	304	46.2	24.58	126	32.1	22.63	14.1	5.73
THROW								
Elementary	215	26.9	22.97	104	31.8	15.72	-4.9	-2.23
Secondary	304	24.1	20.57	126	26.5	16.61	-2.4	-1.27
JUMP								
Elementary	--	--	--	--	--	--	--	--
Secondary	304	53.5	22.58	126	43.5	24.12	10.0	3.98

Note. Mean scores in this table were obtained by scoring performances of visually handicapped children on track and field achievement scales constructed for seeing boys and girls.

decathlon was conducted about a month before the data were gathered for the present study. Since three of the events in the decathlon were similar to those in this study and were given under similar conditions, a "test re-test" comparison was made possible

The reliability coefficients listed for the visually handicapped in Table XII are based on "test re-test" performances of ninety-three boys with defective vision — more than one-sixth of the entire sample of boys used in the present study. In comparison with reliability coefficients reported for the seeing in track and field events, the performances of the visually handicapped appear to be just as consistent.

Correlation Between Trials in Track and Field Events for Visually Handicapped Boys and Girls

By investigating the correlation between trials in track and field events, additional information may be obtained in regard

TABLE XII

RELIABILITY OF TRACK AND FIELD EVENTS FOR THE SEEING AND THE VISUALLY HANDICAPPED

Handicapped		Seeing		
Event	Re-test	Seils' study[3]	Coleman's study[4]	Petroskey's study[5]
Dash	.985	.904	.842	-----
Distance Throw	.947	.982	.821	.890
Standing Broad Jump	.921	.906	.958	.880

to consistency of performance, or reliability. In only two schools for the blind, California and Batavia, did the writer actually record all trials on paper. The data presented in Table XIII are based on performances of 165 pupils, or a little less than one-fifth of the entire sample. Time was saved in most of the schools by giving a pupil three trials in a row in the throw and jump and recording only the best effort. In the dash one trial was given at the beginning of the period and the second at the end of the period The first trial was recorded and then replaced by the second trial if it was better than the first.

For the group of visually handicapped children studied, performance seems to be quite consistent from trial to trial. All but one of the reliability coefficients are over .90. Of course, one cannot be certain that the performances of this group of 165 pupils is representative of the entire population in schools for the blind.

[3]Leroy G. Seils, A Study of the Relationship Between Physical Growth and Gross Motor Development of Primary Children (unpublished Ph.D. thesis, Boston University, 1948 [see also Research Quarterly, May, 1949, p. 143]).

[4]J. W. Coleman, "Pure Speed as a Positive Factor in Some Track and Field Events," Research Quarterly, May, 1940, p. 50.

[5]Helen M. Petroskey, "A Study of Improvement in Fitness of College Freshman Woman," Research Quarterly, December, 1945, pp. 260-61.

TABLE XIII

CORRELATION BETWEEN TRIALS IN TRACK AND FIELD EVENTS FOR VISUALLY HANDICAPPED CHILDREN

Group	Dash	Throw	Jump
Trials for 105 boys			
First and second	.948	.983	.933
First and third		.963	.948
Second and third		.982	.911
Trials for 60 girls			
First and second	.941	.930	.906
First and third		.954	.871
Second and third		.927	.903

Chapter V

COMPARISON OF VISUALLY HANDICAPPED AND SEEING CHILDREN IN A STUNT TYPE TEST

Introduction

This study represents the first attempt to measure motor performance of the visually handicapped by giving a stunt type test to pupils in several schools for the blind. Myler's study, referred to in Chapter I, was limited to one school. In some respects stunts seem to be a fairer measure of motor performance of the blind than do track and field events. Some of the disadvantages of track and field for the blind have been mentioned (Chapter IV). In performing stunts, most of these handicaps are overcome. For example, the fear of injury in running rapidly is eliminated.

Espenschade[1] found that the results of a stunt type test correlate more highly with performance of small muscular acts than do scores in track and field. Apparently the stunt type test measures important factors in motor performance that are not evaluated by other activities in the physical education program. The ability to perform stunts may even have some value in the vocational adjustment of the blind.

There is some difficulty in teaching certain stunts to those without vision. For example, the writer found it particularly difficult to teach the jumping jack, Number 6 in the original Brace Test. In the revision, the Russian Dance was the stunt most difficult for the blind to comprehend. However, instruction was not a serious problem in this study. The lack of vision did not seem to handicap the boys and girls very much in comprehending the stunts.

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[1]Anna Espenschade, Motor Performance in Adolescence. Monographs Society for Research in Child Development, Vol. 1 (Washington, D. C., 1940), p. 20.

TABLE XIV

COMPARISON OF IOWA BRACE SCORES OF VISUALLY HANDICAPPED AND SEEING BOYS

	Visually Handicapped				Seeing				
	N	M	SD	SE	N	M	SD	SE	CR
Elementary	157	10.57	4.06	.3240	100	13.67	3.33	.3330	6.67
Junior High	181	13.20	3.71	.2758	100	14.67	3.32	.3320	3.59
High School	181	12.77	4.07	.3034	100	15.0	3.00	.3000	5.22

Note: Data presented here are based on distribution tables in Appendix I.

TABLE XV

COMPARISON OF IOWA BRACE SCORES OF VISUALLY HANDICAPPED AND SEEING GIRLS

	Visually Handicapped				Seeing				
	N	M	SD	SE	N	M	SD	SE	CR
Elementary	110	8.63	4.49	.4281	150	12.0	4.25	.3469	6.11
Junior High	112	10.4	4.37	.4130	150	15.0	4.05	.3306	8.69
High School	124	9.35	4.59	.4122	150	12.5	4.50	.3673	5.71

Note: Data presented here are based on distribution tables in Appendix I.

Comparison of Scores of Visually Handicapped and Seeing Children in Iowa Brace Test

The scores of the Iowa Brace Test range from 0 to 20. Norms for seeing children are available. The present study presents norms for the visually handicapped. The norms for seeing children were established by McCloy after testing 335 boys and 424 girls. The sample of blind and partially seeing children tested here is even larger than McCloy's group.

In Tables XIV and XV, the mean scores of the visually handicapped are compared with McCloy's norms.[2] The means and

[2]C. H. McCloy, Tests and Measurements in Health and Physical Education (New York: Appleton-Century-Crofts, Inc., 1942), p. 78.

standard deviations for the seeing were obtained from McCloy's[3] T-score table for the Iowa Revision of the Brace Test. The number of seeing children in each group was estimated from the total sample tested in Iowa. Since there are three levels of the Iowa Brace Test, it was assumed that approximately one third of the boys and one third of the girls would fall in each level.

The mean scores of the visually handicapped fall below those of seeing children in all groups, the difference being significant at the .001 level. In the present study, visually handicapped boys more closely approach norms for the seeing than do the girls with defective vision.

Since the mean scores of the visually handicapped are lower than those of seeing children, pupils in schools for the blind must be weak in at least some of the factors measured by the Iowa Brace Test.

These factors are coordination, agility, control, and balance. The next step is to determine whether this weakness is general, or specific, in nature. Are the visually handicapped below normal in all factors, or do they score very low in only a few? This question can be answered by comparing the performance of the visually handicapped and the seeing in each event.

Per Cent of Visually Handicapped and Seeing Passing Iowa Brace Tests

Since each age group of visually handicapped children performed only ten of the twenty-one Iowa Brace Tests, some of the stunts cannot be used in the comparisons to be made here because information is not available. However, there are several points at which the data of the present study can be compared with percentages listed in McCloy's[4] early work. McCloy published percentages for two groups, girls eleven and twelve years old and boys fourteen and fifteen years of age. It was necessary to estimate the size of the groups of seeing boys and girls listed in Table XVI because published data are not available. The age range in the Iowa sample was nine years, but only two years are represented in each group of seeing children for which percentages are available. Therefore, each group

[3] Loc. cit.

[4] C. H. McCloy, "An Analytical Study of the Stunt Type Test as a Measure of Motor Educability," Research Quarterly, VIII 3:46 (October, 1937), p. 50.

represents approximately two-ninths of the 335 boys and 424 girls tested by McCloy. The blind and partially seeing children represented in Table XVI are of the same age and sex as the seeing pupils. Since McCloy lists percentages for twenty-four stunts, some explanation is necessary before one arrives at the final number of twenty-one Iowa Brace Tests. The three stunts which McCloy[5] dropped from his original work were numbers 6, 10, and 24. Stunt 23 was placed in the number 6 position and stunt 22 replaced number 10.

The comparisons listed in Table XVI show that no real differences exist between performances of the visually handicapped and of the seeing, in stunts 3, 6, 13, 14 and 18.

TABLE XVI

COMPARISON OF McCLOY'S AND BUELL'S PERCENTAGES OF CHILDREN+ PASSING CERTAIN IOWA BRACE TESTS

Stunt	Handicapped Boys*	Seeing Boys	Critical Ratio	Probability	Handicapped Girls*	Seeing Girls*	Critical Ratio	Probability
1	84	96	2.70	.01	70	79	1.36	.20
2	99	90	2.56	.02 †	96	81	3.12	.01
3	93	91	0.50	.70	70	71	0.14	.90
6	37	42	0.69	.50	11	13	0.40	.70
8					41	52	1.18	.30
10					97	65	5.32	.001
11					63	52	1.45	.20
12	98	83	3.54	.01				
13	81	81	0.00	.99				
14	85	83	0.60	.60				
16	80	59	3.09	.01	50	51	0.14	.90
17	25	35	1.47	.20	24	35	1.55	.20
18					45	48	0.39	.70
19	71	48	3.16	.01	50	49	0.14	.90
21	23	11	2.15	.05				
	N115	N75 ‡			N74	N100 ‡		

+Girls — 11 and 12 years old; boys — 14 and 15 years old.
*Blind and partially seeing.
†Skewed distribution.
‡Approximately two-ninths of McCloy's (3) samples.

[5]This information was obtained from C. H. McCloy by correspondence.

TABLE XVII

PER CENT OF VISUALLY HANDICAPPED AND SEEING PUPILS PASSING CERTAIN IOWA BRACE TESTS

Stunt	Handicapped Boys*	Seeing Boys	Critical Ratio	Probability	Handicapped Girls*	Seeing Girls	Critical Ratio	Probability
Elementary								
1					70	82	2.21	.03
3	82	92	2.58	.01	72	81	1.66	.10
6					7	30	5.04	.001
7	63	56	1.20	.23				
8	28	16	2.48	.02	39	12	5.00	.001
16	45	52	1.19	.23	41	44	0.48	.70
18					43	33	1.62	.11
	N157	N128			N110	N141		
Junior High								
1	78	99	6.60	.001‡	66	87	4.07	.001
3	92	95	1.12	.26				
6	33	38	0.95	.40				
14	80	98	5.64	.001‡				
16	70	67	0.58	.60	44	50	1.00	.40
	N181	N150			N112	N176		
High School								
3	90	100†	1.49	.14‡	63	80	2.34	.02
5	90	82†	1.90	.06				
7					65	48	2.13	.04
14	90	100†	1.49	.14‡				
16	82	94†	3.31	.001	35	36	0.14	.90
18					37	19	2.49	.02
21	23	41	3.25	.001				
	N181	N116			N124	N56		

*Blind and partially seeing.

†Percentages are high because of practice obtained in Espenschade's (1) longitudinal study.

‡Skewed distribution.

These stunts are the grapevine (static balance), double heel click (agility), half turn jump (control), three dips (strength), and full right turn (agility). In stunt 8 (agility), the seeing girls seem to perform better, while the visually handicapped appear to be a little superior in number 11 (agility). In another test of agility, number 16 (kneel, jump to feet), the results do not show a clear tendency. In this stunt, visually handicapped boys perform significantly better than do seeing boys, but the trend is not repeated for the girls. In the top stunt (number 19), the visually handicapped boys again excel the seeing, but the girls do not.

In some of the other tests of the Iowa Brace, more definite trends appear. In the Russian Dance (number 17), the seeing children seem to excel and this tendency is much more pronounced in stunt 1 (one foot — touch head). The former test depends upon agility, while the latter requires control of the body. The blind are significantly superior in tests 2 (side leaning rest), 10 (hop backward), and 12 (full-squat — arm circles). In the jump foot stunt (number 21), the visually handicapped perform better than the seeing boys in McCloy's group, but a contradictory result is found when Espenschade's percentages are used for comparison in Table XVII.

Before drawing any conclusions, it is advisable to compare the performance of the visually handicapped with another group of seeing children. Since Espenschade[6] has given the Brace Test to a large group of California children, such a comparison can be made.

Comparison of Buell's and Espenschade's Percentages of Children Passing Iowa Brace Tests

Espenschade[7] has published percentages for children passing the Brace Tests, and several comparisons can be made with the present study. Ten of the original stunts were retained in McCloy's revision, which was the test given to the visually handicapped.

In one respect, the work of Espenschade is comparable to that of the writer in the present study. She did all of her testing and scoring, rather than permitting children to score each

[6]Espenschade, Motor Performance in Adolescence, p. 20.

[7]Anna Espenschade, "Development of Motor Coordination in Boys and Girls," Research Quarterly, 18:1 (March, 1947), pp. 35-38.

other, as suggested by McCloy. The different methods of testing are probably responsible for some of the discrepancies reported by McCloy and Espenschade.

In a personal conference with Dr. Espenschade, the writer discovered that his scoring differed from hers in two stunts, numbers 8 and 18. These are the full left turn and full right turn tests. The visually handicapped were permitted to land with their feet apart, while Espenschade required the feet to be touching. This probably accounts for the superiority reported for the visually handicapped in tests 8 and 18, Table XVII. Of course, it is possible that the blind and partially seeing have more agility and balance than do normal children, but such relationships are not evident from the comparisons available here.

The percentages listed for the seeing in Table XVII were obtained from the two works of Espenschade referred to above. Since the present study is cross sectional in nature, most of the data for the seeing are taken from a similar type of study by Espenschade. However, a few percentages from her longitudinal study are included to increase the number of comparisons that can be made. The percentages listed in the longitudinal study tend to be above normal, because the children became familiar with the tests, after having repeated them for a number of years.

Espenschade's percentages are listed for each age and sex. In order to reduce duplication and some statistical work, the ages have been combined into three groups elementary, junior and senior high school. The ages represented in each group are as follows:

Elementary----------Ages 10, 11, and 12
Junior High ----------Ages 13, 14, and 15
High School ----------16 years old and over

By referring to Table XVII, it will be seen that there seems to be little difference between the performances of the visually handicapped and the seeing in stunt 16. There is little difference between the performances of the two groups in stunt 14 at the high school level, but there is a critical ratio of 5.64 in favor of the seeing at the junior high school level. In test 7 (cross leg squat), visually handicapped girls perform significantly better than the seeing, but the critical ratio in favor of the boys with defective vision is only 1.20. The seeing girls definitely excel in the double heel click, but this relationship does not appear in the comparison of the two groups of boys.

Table XVII shows that seeing high school boys excel in stunt 21. It will be recalled that fourteen and fifteen-year-old visually-handicapped boys excelled in this stunt in the comparison with McCloy's group. The difference of two years in average age of the groups in McCloy's and Espenschade's groups does not seem to be large enough to account for obtaining contradictory results. It is possible that no significant difference exists between the seeing and those with defective vision in the jump foot stunt (number 21).

In test 3 the seeing performed better than the visually handicapped but the differences were significant at the .05 level for only two of the five groups compared. In both Espenschade's and McCloy's studies, the seeing excelled the handicapped in stunt 1 (one foot — touch head).

The visually handicapped excel the seeing in stunt 5 (stork stand). The superiority of children with defective vision reported in test 8 and 18 is questionable, because of the different methods of judging. The writer permitted the visually handicapped to land with their feet apart, while Espenschade required the feet to be touching.

A summary of the two comparisons reveals a few definite trends. Seeing children are significantly superior in test 1, while the visually handicapped excel in stunts 2, 5, 10, and 12. In the stork stand and the five backward hops, the child is not permitted to open his eyes. This probably explains the advantage of the blind in these tests. Why the visually handicapped should excel in the side leaning rest and the full squat with arm circles is not clear.

No definite superiority for either group seems to exist in stunts 3, 6, 7, 8, 11, 17, 18, 19 and 21. Both comparisons show that no real difference exists between the performances of those with defective vison and the seeing in three tests, the half turn jump, the three dips, and the kneel, jump to feet.

Although the visually handicapped score significantly below normal on the Iowa Brace Test, their weakness seems to be spread over many factors rather than limited to only a few. In no one factor, body control, static balance, strength, agility, and coordination, do the mean scores of the handicapped always fall below normal. Perhaps the visually handicapped compare more favorably with the seeing in static balance than in any of the other factors measured by the Iowa Brace Test.

Effect of Allowing a Third Trial in the Iowa Brace Tests

In certain manual dexterity tests, it has been found that the norms for seeing children can be used for the blind, if two or three extra trials are allowed. With this in mind, the writer gave each visually handicapped child an extra trial in the Iowa Brace Tests. The results for two trials and three trials are shown in Table XVIII. It can be seen that most of the gains are rather small. A third trial seems to have little effect upon the results from tests 2, 3, 5, 6, 10, 12, 14, 16, 19, and 21.

TABLE XVIII

PERCENTAGES OF VISUALLY HANDICAPPED PUPILS PASSING IOWA BRACE TESTS — TWO AND THREE TRIALS

Stunt	Elementary				Junior High				High School			
	Boys		Girls		Boys		Girls		Boys		Girls	
	(2)*	(3)†	(2)	(3)	(2)	(3)	(2)	(3)	(2)	(3)	(2)	(3)
1			70	71	78	83	66	74	86	90		
2	97	97			97	99	96	98			94	95
3	82	83	72	73	92	93			90	91	63	68
4	64	70										
5									90	92		
6			7	7	35	37						
7	63	66									65	69
8	28	35	39	43								
9											43	56
10	99	99	95	97								
11	65	71	60	63			61	69	87	89	68	72
12					98	98	92	92				
13	48	55			76	83	67	86				
14					80	80			92	93		
15			26	29			50	56	78	82		
16	45	48	41	41	70	72	44	46	82	83	35	37
17	19	22			27	31	24	25	45	48	32	36
18			43	45							37	44
19			51	54	71	75	60	61			54	56
20							33	41	50	55	44	51
21									23	26		
	N 157		N 110		N 181		N 112		N 181		N 124	

*(2) = results of two trials. †(3) = results of three trials.

The stunts in which most gains occur are 1, 9, and 13, followed by 8 and 11.

Although a third trial seems to improve the scores of the blind and partially seeing, it does not bring their performance up to that of the seeing. More than one extra trial in the Iowa Brace Tests is required to bring the performance of the visually handicapped up to the norms of seeing children.

Chapter VI

COMPARISON OF BLIND AND PARTIALLY SEEING CHILDREN IN MOTOR PERFORMANCE

Emotionalism Versus the Objective Approach

The lack of an objective approach to problems of blindness is rather common, even in schools and institutions for the blind. It is extremely difficult to approach such work without emotionalism. Even wise and experienced teachers must be constantly on the alert to maintain an objective attitude. Often the blind themselves do not want to face the truth. In some sports, for example, many blind boys firmly believe that they compete on an equal basis with the seeing. Unfortunately, this is not true. Even in wrestling, those without vision face a slight handicap.

Many teachers, including the writer, would like to believe that the blind can compete in some sports on an equal basis, at least, with the partially seeing. In Sports for the Blind this statement appears: "The author has found these scales to be absolutely fair to the totally blind and partially seeing. Achievement scales have been prepared only in the events where competition is on an equal basis.[1] The three track and field events used in the present study are included in the achievement scales referred to. The data presented in this chapter indicate rather conclusively that the blind do not compete on an equal basis with the partially seeing in throwing for distance and in running. The difference in viewpoint listed here is a result of a more objective approach.

Sports for the Blind has been widely circulated in the field, and the writer has talked with many teachers of the blind in various sections of the United States. In two years no one has challenged the writer's statement on the ability of the blind to compete on equal terms with the partially seeing in running, throwing, and jumping. It is amazing that this viewpoint was

[1]Charles E. Buell, Sports for the Blind (New York: American Foundation for the Blind, 1947), p. 186.

accepted, because evidence presented below seems to disprove it. Evidently others follow a course of wishful thinking.

The present study seeks to be as objective as possible. A large sample of visually handicapped children was studied, and the results are presented here in an impartial manner. It is hoped that the detailed presentation will make clear certain differences in motor performance of the blind and partially seeing which have not received attention.

Method of Classifying and Scoring in Track and Field Events

The relationships developed here, and in Chapter VII, are based upon the use of achievement scales in Sports for the Blind.[2] Although some of these scales are in need of revision, they more accurately measure the performance of the visually handicapped than do the achievement scales for seeing children. Since the norms for the seeing are higher, the scores of children with defective vision tend to accumulate at the bottom of the scales. By comparing Appendices B and C with Appendices D and E, the difference in the number of scores at the bottom of the distributions becomes quite evident. Achievement scales for the visually handicapped include the standing broad jump which is not listed in scales for seeing girls in the elementary and junior high schools.

It will be recalled that one of the advantages of achievement scales is that a score in one class is equivalent to the same score in another class. By combining classes, it is possible to obtain larger samples for comparisons in the performances of two groups, such as blind and partially seeing boys. When the number of cases is limited, any other such plan seems to be impractical. The wide range of performance in track and field events, and the dissimilarity of ages, weights, and heights makes it difficult to approach the problem in any other manner.

Comparison of Blind and Partially Seeing Children in Track and Field

A few physical educators in schools for the blind have misled the public by claiming that certain feats were performed by the blind, rather than the partially seeing. When one learns of an outstanding feat of a visually handicapped individual,

[2]Buell, op. cit., pp. 195-219.

he should obtain information regarding the amount of useful vision before an evaluation is made. Useful vision is a factor which definitely influences performance in many physical activities.

The performance of the blind and partially seeing in running, throwing, and jumping are compared in Appendices D and E. It seemed unnecessary to make separate calculations of the significance of the difference of the means for the various classes in running, jumping, and throwing, because approximately the same result would have been obtained again and again. Therefore, the distribution tables shown in Appendices D and E were combined to obtain the results listed in Table XIX.

The data in Table XIX indicate that a significant difference exists between the performance of the blind and the partially seeing in track and field events. Five of the six comparisons are significant at the .001 level. The difference between the means in the broad jump for the blind and the partially seeing is not significant. It would seem that the amount of vision is not an important factor for boys in this event. It will be recalled that the visually handicapped high school boys excelled

TABLE XIX

COMPARISON OF BLIND AND PARTIALLY SEEING PUPILS IN TRACK AND FIELD* (COMBINED CLASSES— BUELL'S ACHIEVEMENT SCALES)

	Blind			Partially Seeing				
	M†	SD	SE	M†	SD	SE	D	CR
Boys								
Dash	34.3	24.54	1.850	48.2	25.24	1.363	13.9	6.07
Throw	32.5	13.00	.9800	44.2	19.44	1.050	11.7	8.22
Jump	38.0	24.96	1.881	41.5	23.64	1.276	3.5	1.53
Girls								
Dash	27.3	21.54	1.868	46.3	22.98	1.575	19.0	7.81
Throw	27.7	14.11	1.223	39.1	15.72	1.077	11.4	6.99
Jump	39.8	27.11	2.351	49.8	26.66	1.827	10.0	3.35

*Number of cases: 176 blind boys, 343 partially seeing boys, 133 blind girls, 213 partially seeing girls.

†Mean scores refer to scores on achievement scales in Sports for the Blind.

Note: Data in this table are based on distribution tables in Appendices D and E.

the seeing in the broad jump. However, this relationship does not exist for the girls. The seeing girls jumped much better than the visually handicapped, and the partially seeing girls performed significantly better than the blind. From what has been said, it is clear that the greatest differences are in running and throwing. The handicaps for the blind in the dash, and their difficulty in learning to throw have already been mentioned.

Comparison of Blind and Partially Seeing Pupils on the Iowa Brace Test

A useful method to determine the influence of vision upon motor performance is by giving a stunt-type test. Children with defective vision have little handicap in performing most stunts. Vision is not required to perform any of the twenty-one stunts of the Iowa Brace Test.

The mean scores for the blind and for the partially seeing children in the Iowa Brace Test are shown in Table XX. At the elementary level, the partially seeing boys and girls both score higher than do the blind, the differences being significant at the .05 level. In junior high school, partially seeing girls score significantly higher than do blind girls, but this relationship

TABLE XX

COMPARISON OF BRACE SCORES OF BLIND AND PARTIALLY SEEING PUPILS

	Blind			Partially Seeing				
	M	SD	SE	M	SD	SE	D	CR
Boys								
Elementary	9.56	3.82	.5298	11.08	4.06	.3961	1.52	2.33
Junior High	13.36	3.58	.4786	13.14	3.75	.3354	.22	.30
High School	12.97	3.84	.4621	12.64	4.20	.3970	.33	.54
Girls								
Elementary	7.53	4.03	.6538	9.21	4.61	.5433	1.68	1.97
Junior High	9.13	4.59	.7451	11.51	3.74	.4349	2.38	2.76
High School	8.86	4.50	.5859	9.78	4.62	.5732	.92	1.12

Note. Data in this table are based on distribution tables in Appendix J.

does not exist between the mean scores of the two groups of boys. At the high school level, there is little difference between the performances of the blind and the partially seeing. It would seem that blind boys progress more rapidly in factors measured by the Iowa Brace Test than do blind girls, because boys without vision reach the level of performance of the partially seeing at an earlier age than do the girls. Since blind boys and girls overtake the partially seeing in performance on the Iowa Brace Test, it would indicate that those without vision make more rapid progress in factors influencing gross motor acts measured by the test—coordination, agility, and control of body.

When the percentages of visually handicapped and seeing children passing individual Iowa Brace Tests were compared in Chapter V, some significant differences were discovered. With this in mind, the same procedure was applied to the

TABLE XXI

PER CENT OF BLIND AND PARTIALLY SEEING ELEMENTARY PUPILS PASSING CERTAIN IOWA BRACE TESTS

Stunt	Blind Boys	Seeing Boys*	Critical Ratio	Probability	Blind Girls	Seeing Girls*	Critical Ratio	Probability
1					58	78	2.14	.05
2	90	98	1.99	.05				
3	79	84	0.78	.50	76	71	0.57	.60
4	63	73	1.26	.30				
6					5	8	0.59	.60†
7	62	69	0.87	.40				
8	29	38	1.12	.40	32	50	1.83	.10
10	98	100†	1.18†	.40†	92	100†	2.04†	.05†
11	75	70	0.67	.60	56	67	1.13	.30
13	42	61	2.24	.05				
15					21	35	1.56	.20
16	40	51	1.30	.20	34	44	1.02	.40
17	13	32	2.71	.01				
18					32	50	1.83	.10
19					42	61	1.89	.10
	N 52	N 105			N 38	N 72		

*Partially seeing.

†Skewed distribution, cannot place complete confidence in result.

TABLE XXII

PER CENT OF BLIND AND PARTIALLY SEEING SECONDARY SCHOOL GIRLS PASSING CERTAIN IOWA BRACE TESTS

	JUNIOR HIGH				HIGH SCHOOL			
Stunt	Blind	Partially Seeing	Critical Ratio	Probability	Blind	Partially Seeing	Critical Ratio	Probability
1	56	81	2.82	.01				
2	95	96	0.24	.90	95	94	0.24	.90
3					75	62	1.56	.20
7					69	71	0.24	.90
9					47	65	2.02	.05
11	71	68	0.33	.80	73	71	0.25	.90
12	92	92	0.00	.99				
13	68	80	1.37	.20				
15	45	62	1.71	.10				
16	37	51	1.41	.20	36	38	0.23	.90
17	21	27	0.70	.50	32	40	0.93	.40
18					51	40	1.01	.40
19	56	64	0.82	.50	51	60	1.01	.40
20	39	42	0.31	.80	49	52	0.33	.80
	N 38	N 74			N 59	N 65		

performances of the partially seeing and blind children. The results of the comparisons are listed in Tables XXI and XXII. Secondary school boys are not listed because only one significant difference between the means of the blind and partially seeing was discovered. In stunt 1 the differences between the mean scores of the blind and the partially seeing in junior and senior high schools are significant at the .05 level.

By referring to Tables XXI and XXII, it will be seen that the partially seeing performed significantly better in stunt 1 (one foot--touch head to floor) and 9 (one knee—head to floor). Both of these feats are somewhat similar, in that to be balanced, one must be aware of the angle which the body forms with the floor. Vision seems to be important in judging the distance between the floor and the upper part of the body, because the blind do not perform as well as those with vision in this event.

In most of the Iowa Brace Tests, amount of vision is not the determining factor in success or failure. Since this conclusion was reached in Chapter V, the comparisons made here

of the blind and partially seeing have added few conclusive results. However, new tendencies have become evident. In test 15 (side kick), the difference between the percentages is significant in favor of the partially seeing girls at the .10 level. At least one group of partially seeing children performed significantly better in tests 10, 13, and 17. These stunts are, respectively, five backward hops, half turn jump, and the Russian Dance. It will be recalled that the visually handicapped excelled the seeing in Tests 2 and 10. The lack of vision seemed to be an advantage in these stunts. Therefore, it is somewhat surprising to find the partially seeing boys performing significantly better in test 2, and the girls with useful vision excelling the blind in stunt 10 (significant at .05 level). Perhaps, then, there are factors other than the amount of vision which influence performance in the Iowa Brace Tests.

Chapter VII

RELATIONSHIP BETWEEN PARENTAL ATTITUDES AND MOTOR PERFORMANCE

Most of the present work is devoted to considerations of the influence of vision upon motor performance. However, there is another factor which appears to have an important bearing upon the physical activities of children with defective vision. This is the overprotective attitude of some parents of visually handicapped children. Of course, the loss of vision in the child is primarily responsible for the parents' overprotective attitude.

Prevalence of Overprotection Among Visually Handicapped Children

Overprotection on the part of parents is a rather common condition surrounding loss of vision in children. Teachers and staff members in schools for the blind have long been aware of this condition. It becomes evident in visits of certain parents to the school or in letters received from home by the children. A visually handicapped child usually asks a house-parent or teacher to read letters to him. Parents of overprotected children do not encourage boys and girls to do things for themselves. When these children arrive at school, they often have difficulty in caring for themselves, including dressing and simple toilet care. Educators of the blind firmly believe that a child's inability to properly care for himself is closely related to the overprotection received in the home.

In the opinion of teachers and staff members of schools taking part in this study, overprotection in visually handicapped children is rather prevalent. Table XXIII shows the extent of this influence on blind and partially seeing children.

Data in Table XXIII indicate that parents are more sympathetic toward children without vision. They probably feel that the partially seeing are more able to care for themselves. It is interesting to note that a tendency of parents to protect girls more than boys is not evident here.

One cannot teach physical education to the blind very long without becoming aware of the limited activity of certain pupils.

TABLE XXIII

PER CENT OF VISUALLY HANDICAPPED CHILDREN WHO ARE OVERPROTECTED

Type of children	Total number	Number overprotected	Per cent overprotected
Blind boys	176	47	27
Blind girls	133	36	30
Partially seeing boys	343	43	13
Partially seeing girls	213	20	9

Upon investigating their background, it has usually been found that the parents have protected the individuals so much that they have not had an opportunity to develop. These boys and girls have not been permitted to run, to climb, and to throw things, as other children do. Buell[1] found that their arm and shoulder strength is below normal. Most educators of the blind believe that parents do a visually handicapped child an injustice in their desire to aid him. It is the writer's[2] opinion that if a child is not permitted to be physically active before the age of ten, some of the harm done can never be overcome.

In order to give the blind child an equal opportunity in life, school authorities have issued many lengthy instructions on how to care for those without vision. In one hundred years there has been little improvement on the original work of Dr. Howe, who wrote:

> Never check the actions of the child; follow him, and watch him to prevent any serious accidents, but do not interfere unnecessarily; do not even remove obstacles which he would learn to avoid by tumbling over them a few times. Teach him to jump rope, to swing weights, to raise his body by his arms and to mingle, as far as possible, in the rough sports of the older boys, and do

[1] Charles E. Buell, Sports for the Blind (New York: American Foundation for the Blind, 1947), p. 177.

[2] As student and teacher, the writer has been closely associated with schools for the blind for thirty years.

TABLE XXIV

COMPARISON OF OVERPROTECTED PUPILS WITH BALANCE OF SAMPLE IN TRACK AND FIELD EVENTS*

Event	Balance of Sample			Overprotected				
	M	SD	SE	M	SD	SE	D	CR
Blind Boys								
Dash	41.9	22.63	1.992	13.4	16.55	2.414	28.5	9.08
Throw	36.3	20.35	1.792	21.9	14.07	2.136	14.4	5.14
Jump	44.9	22.93	2.019	19.2	20.10	2.932	25.7	7.22
Partially Seeing Boys								
Dash	50.5	24.25	1.400	32.2	26.12	3.984	18.3	4.35
Throw	45.1	19.72	1.139	38.2	16.12	2.458	6.9	2.55
Jump	43.1	23.28	1.344	30.3	23.04	3.514	12.8	3.40
Blind Girls								
Dash	30.7	22.00	2.234	18.1	17.18	2.904	12.6	3.44
Throw	30.4	14.49	1.471	20.3	9.80	2.248	10.1	3.79
Jump	45.2	26.98	2.739	25.3	21.52	3.638	19.9	4.81
Partially Seeing Girls								
Dash	48.4	21.77	1.567	26.5	25.02	5.740	21.9	3.66
Throw	40.1	15.49	1.115	29.0	14.32	3.285	11.1	3.20
Jump	51.7	26.30	1.893	32.0	23.22	5.327	19.7	3.48

*Mean scores refer to scores on Buell's achievement scales for the visually handicapped published in Sports for the Blind. When achievement scales of the present study are used, the critical ratios obtained are about the same as those shown above.

Note. Data in this table are based on distribution tables in Appendices G and H.

> not be apprehensive of his safety, and if you should see him clambering in the branches of a tree, be sure he is less likely to fall than if he had eyes. Do not too much regard bumps upon the forehead, rough scratches or bloody noses, even these may have their good influences. At the worst, they affect only the bark, and do not injure the system like the rust of inaction.[3]

"Let a boy saw wood, take care of cattle, do jobs about the house, and if you can afford it, let him have a leader for long excursions, let him learn to ride, swim, to row and to skate, etc. Bring up a girl to be active about the house."[4] Though deaf-blind, Laura Bridgman was very active and took walks of six miles.[5]

Performance of Overprotected Children in Track and Field Events

Because of their poor performance, overprotected visually handicapped children are conspicuous in track and field. The data presented in Table XXIV indicated the weakness of overprotected children in running, throwing, and jumping. All but one of the differences are significant at the .001 level. There can be little doubt that the overprotective attitude of parents of children with defective vision influences performance in track and field events.

Scores of Overprotected Visually Handicapped Children on the Iowa Brace Test

Perhaps the stunt type of test would measure better the protective influence on motor performance than do track and field events. In stunts the fear of injury is reduced to a minimum because it is not necessary for the individual to move about a great deal. With this in mind, the data in Table XXV were prepared. Since it has been shown that vision influences mean scores on the Iowa Brace Test for elementary boys and girls and junior high school girls, these children were divided into groups of blind and partially seeing. On the other levels, it seemed unnecessary to make any division because vision has little, if any, bearing on scores of the Iowa Brace Test.

[3] Perkins Report, 1841, p. 7.
[4] Ibid., p. 8.
[5] Ibid., p. 23

TABLE XXV

IOWA BRACE SCORES OF OVERPROTECTED VISUALLY HANDICAPPED CHILDREN

Groups of Children	Overprotected			Remainder of Groups					
	N	M	SD	N	M	SE_d	D	t	P
Elem. seeing boys*	16	9.8	4.06	89	11.3	1.102	1.5	1.36	.40
Elem. blind girls	14	5.9	4.03	24	8.5	1.355	2.6	1.92	.10
Elem. seeing girls*	5	8.2	4.61	67	9.3	2.091	1.1	0.53	.60
J. H. blind girls	11	6.3	4.59	27	10.3	1.641	4.0	2.44	.02
J. H. seeing girls*	6	8.3	3.74	68	11.8	1.593	3.5	2.20	.05
	N	M	SD	N	M	SD	D	CR	
Elem. blind boys	23	8.1	3.89	29	10.4	4.03	2.3	2.04	
J. H. boys†	30	11.0	3.55	151	13.4	3.72	2.4	3.29	
H. S. boys†	19	11.1	4.13	162	12.9	4.07	1.8	1.76	
H. S. girls†	25	6.6	4.50	99	10.5	4.62	3.9	3.79	

*Partially seeing.

†Blind and partially seeing combined.

Note: In upper part of table, formula (H. E. Garrett, Statistics in Psychology and Education, New York: Longmans, Green and Company, 1947, p. 206) for small samples was used to calculate reliability of the difference between means.

The differences between the means of overprotected pupils and the remainder of their respective groups are significant at the .05 level in five of the nine comparisons, and two of the others closely approach this level of significance. The overprotective attitude of parents of partially seeing elementary children does not seem to influence scores on the Iowa Brace Test. The number of cases on some of the levels is rather small, so only limited confidence can be placed in their results. The attitude of overprotection seems to influence performance on a stunt type test. Pupils who participate in limited activities do not have an equal opportunity to develop coordination, balance, and control of the body.

Motor Performance of Neglected Visually Handicapped Children

As will be found in most groups, parents of visually handicapped children may or may not meet their responsibilities. It will be recalled that many cases of neglected children were

mentioned by authorities in the schools taking part in this study. It may be of some value to investigate the motor performance of this group, and compare the results with those obtained in the study of overprotected children.

In Tables XXVI and XXVII, the motor performances of neglected visually handicapped pupils are compared with those of children whose home environment is normal. There are no significant differences in the performances of these two groups in track and field or in the stunt type test. To make the results more reliable, overprotected pupils were dropped from this part of the study. Although not included in Table XXVI, data for neglected visually handicapped girls show the same lack of significant influence found for the boys.

Since neglected children perform normally in motor acts, it would appear that in this respect they are more adjusted than the protected individuals. In other words, as far as motor performance is concerned, parental neglect is to be preferred to overprotection. This point is raised here because one cannot overemphasize the harm done to visually handicapped children by overprotective parents.

TABLE XXVI

COMPARISON OF PERFORMANCES IN TRACK AND FIELD OF NEGLECTED VISUALLY HANDICAPPED BOYS AND BOYS WITH DEFECTIVE VISION WHOSE HOME ENIVRONMENT IS NORMAL*

	Normal Home			Neglected Home				
Event	N	M	SD	N	M	SD	D	CR
Blind								
Dash	108	43.0	22.63	21	35.9	21.03	7.1	1.48
Throw	108	37.0	20.35	21	33.8	18.47	3.2	0.94
Jump	108	45.2	22.93	21	43.4	21.00	1.8	0.32
Partially Seeing								
Dash	265	49.9	24.25	35	55.0	25.21	-5.1	-1.13
Throw	265	44.7	19.72	35	48.4	20.53	-3.7	-1.01
Jump	265	42.7	23.28	35	46.0	24.04	-3.3	-0.76

*Mean scores were obtained from Buell's achievement scales in Sports for the Blind. When the achievement scales in the present study are used, the critical ratios obtained are similar to those shown above, indicating no significant differences between the means.

TABLE XXVII

COMPARISON OF IOWA BRACE SCORE OF NEGLECTED VISUALLY HANDICAPPED PUPILS AND THOSE WHOSE HOME ENVIRONMENT IS NORMAL*

Groups of Children	Neglected Home N	M_1	SD	Normal Home N	M_2	SD	$M_1 - M_2$	t	P
Elem. blind boys	4	13.28	3.88	25	10.04	3.88	3.24	1.36	.20
Elem. seeing boys†	9	11.73	4.06	80	11.27	4.06	0.46	0.31	.80
Elem. blind girls	3	8.51	4.03	21	8.50	4.03	0.01	0.00	.99
Elem. seeing girls†	7	9.40	4.61	60	9.29	4.61	0.11	0.06	.99
J. H. blind girls	2	8.00	4.59	25	10.48	4.59	-2.48	-0.53	.60
J. H. seeing girls†	4	12.37	3.74	64	11.76	3.74	0.61	0.28	.80
H. S. girls‡	11	10.09	4.59	88	10.48	4.59	-0.39	-0.25	.80
	N	M_1	SD	N	M_2	SD	$M_1 - M_2$	CR	
J. H. boys‡	24	13.64	3.79	127	13.38	3.71	0.26	0.30	
H. S. boys‡	19	13.54	3.99	143	12.82	4.07	0.72	0.71	

*Overprotected pupils excluded.

†Partially seeing.

‡Blind and partially seeing combined.

Note. In upper part of table formula (H. E. Garrett, Statistics in Psychology and Education, p. 206) for small samples was used to calculate reliability of the difference between means.

Chapter VIII

RELATION OF MOTOR PERFORMANCE TO TIME OF LOSS OF VISION

After watching blind children perform in physical education classes for fifteen years, the writer believes that a relationship might exist between the time of loss of vision and a child's ability in athletics. This theory is based upon the fact that some blind boys without vision for only a few years perform unusually well. As far as motor performance is concerned, it appears that it is a distinct advantage to have vision as long as possible. By talking with many people in the general public, the writer learned that most of them believed that children blind from birth have an advantage in athletics over those blinded later in life. They reason that children who have been without vision for the longer period of time have had more opportunity to adjust themselves to their handicap. Thus, we have viewpoints favoring each side of the question.

The only way to determine accurately the influence of time of loss of vision upon motor performance is to obtain a large sample and treat the data statistically.

About one fourth of the blind pupils taking part in this study lost their vision after six years of age. Most blind children lose their vision early in life, usually before the age of two. Early onset of eye trouble is even more common in partially seeing children. Comparatively few of them become handicapped after entering school.

Only results for the blind are considered here, because it has been shown earlier that complete loss of vision affects motor performance more than a partial loss. If there is any relationship between time of loss of vision and motor performance, it would be most evident in the results of the totally blind.

Another factor that must be considered in the comparisons to be made here is the overprotective attitude of some parents of blind children. It was found that the percentage of overprotective cases was higher for the group blind from birth rather than the recently blinded. It is possible that parents of

hereditary and congenitally blind children blame themselves for bringing a severely handicapped individual into the world. Since overprotected pupils perform below normal, and the percentage of overprotective cases is not the same for the two groups to be compared, all of them were dropped from this part of the study. Thus, a factor that might have influenced the results was largely eliminated.

The comparison of the performance of those blind from birth and the recently blinded is limited to track and field events because the number of cases at each level of the Iowa Brace Test was small. By equating track and field performance on achievement scales in Chapter X, it is possible to obtain enough cases to make some comparisons that may yield reliable results. Table XXVIII shows that all the differences between the means favor the recently blinded girls and are significant at the .05 level, while the difference between the means in the boys' basketball throw also attains this level of significance. Those who have possessed vision long enough to learn to throw by viewing the action, perform significantly better than individuals who have never seen this intricate motor act.

TABLE XXVIII

RELATION OF PERFORMANCE IN TRACK AND FIELD EVENTS TO TIME OF LOSS OF VISION*

	Blind from Birth			Blinded after Six Years of Age				
Events	N	M_B	SD	N	M_A	SD	$M_A - M_B$	CR
Girls								
Dash	67	52.40	17.64	30	59.50	15.68	7.10	1.95
Throw	67	53.59	18.73	30	64.17	16.16	10.58	2.69
Jump	67	52.10	17.20	30	61.10	19.05	9.00	2.35
Boys								
Dash	84	60.35	17.69	45	64.50	18.19	4.15	1.25
Throw	84	50.23	16.52	45	57.83	19.70	7.60	2.20
Jump	84	55.59	18.08	45	60.50	16.97	4.91	1.55

*Mean scores were obtained from achievement scales in the present study. When achievement scales in Sports for the Blind are used the critical ratios are lower. (See Appendix M.)

Note. Performances of overprotected pupils are not included in this table.

Children who lose their vision after six years of age do not have as much difficulty in adjusting to physical activities as most people believe. In fact, they have certain advantages that have been denied those who lose their vision in early childhood. The relationship developed here is additional evidence to indicate the importance of vision in life's varied activities. Vision is a blessing, even if it is possessed for only a limited number of years.

Chapter IX

CLASSIFICATION OF VISUALLY HANDICAPPED CHILDREN

Plan of Classification Used in Schools for the Blind

The classification chart used in most schools for the blind is one constructed for seeing boys and girls. The chart shown in Appendix F is used to classify pupils for the annual track meet of the National Athletic Association of Schools for the Blind. It is also the classification plan used with the achievement scales presented in Sports for the Blind.[1] For seeing children, this is a valid plan of classification for competition in track and field. Authorities[2] agree closely on the weightings which should be given to the factors age, height and weight. Most educators of the visually handicapped assume that these factors have the same weightings in influencing track and field performance of those with defective vision.

Evidence presented in this chapter shows that there is a more valid classification index for visually handicapped children than the one now in use. However, the correlation between the two plans is over .90. Since the present plan is reasonably valid, some schools will probably continue to use it. If this is done, one weakness of the plan should be remedied.

Suggested Revision of Classification Plan in Common Use in Schools for the Blind

In the classification chart as it is now used (Appendix F) boys with a sum of exponents less than 20, all fall in Class E. This means that ten-year-old boys must compete with classmates who are one or two years older. After having used the

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[1]Charles E. Buell, Sports for the Blind (New York: American Foundation for the Blind, 1947), p. 188.

[2]N. P. Neilson and F. W. Cozens, Achievement Scales in Physical Education Activities for Boys and Girls in Elementary and Junior High Schools (New York: A. S. Barnes Co., 1939), p. 162.

chart for a number of years, the author decided that the younger boys were at a distinct disadvantage. The large sample used in the present study made it possible to test this hypothesis.

After a little experimentation, it was decided to include all pupils with a sum of exponents below 12, in the extra class. The boys who were formerly in Class E were placed in Classes E and F while girls of this same exponent level were divided into Classes D and E. The performance of the boys in Class E was compared with that of Class F and the same procedure was followed for the girls in Classes D and E. The scores were obtained from the girls' Class D and the boys' Class E achievement scales for the visually handicapped.[3] The results of these comparisons are shown in Table XXIX.

For the boys in Classes E and F, it will be seen that the difference between the means in the dash is significant at the .05 level. The differences in the basketball throw and the standing broad jump are even greater. There can be little doubt that the younger boys must have a class of their own to compete on equal terms with older classmates.

Since girls' performances do not vary as much as do those of boys, it might be expected that the difference between the girls' Classes D and E would not be great. In spite of this, it will be seen that the difference of the means in the basketball throw is significant at the .001 level. The difference in the standing broad jump is also quite significant. The two classes do not differ much in running the 50 yard dash. This evidence would indicate that the younger girls should be placed in Class E rather than in Class D, as is now the case.

Best-Fit Classification Indexes for Visually Handicapped Boys and Girls

Educators in schools for the blind have assumed that children with defective vision should be classified in the same manner as seeing boys and girls. Since a large sample and pertinent information were available in the present study, it was decided to develop a best-fit classification index for visually handicapped children which might improve upon one set up empirically.

[3]Buell, op. cit., pp. 195-219.

TABLE XXIX

COMPARISON OF PERFORMANCE OF VISUALLY HANDICAPPED BOYS IN CLASSES E AND F — GIRLS IN CLASSES D AND E, REVISED N.A.A.S.B. CLASSIFICATION

	Class E				Class P					
	N	M	SD	SE	N	M	SD	SE	D	CR
Boys										
Dash	97	36.4	25.86	2.626	71	27.0	26.10	3.097	9.4	2.32
Throw	97	39.1	16.57	1.682	71	31.5	13.99	1.660	7.6	3.22
Jump	97	38.4	26.07	2.647	71	27.0	23.84	2.829	11.4	2.92
	Class D				Class E					
Girls										
Dash	52	34.5	23.45	3.284	44	30.9	22.41	3.418	3.6	0.76
Throw	52	43.2	15.81	2.211	44	32.9	10.64	1.623	10.3	3.76
Jump	52	50.5	26.48	3.708	44	40.4	29.10	4.438	10.1	1.75

Note. Mean scores in this table were obtained by scoring performances on achievement scales presented by Buell in Sports for the Blind.

Since elementary and secondary seeing pupils are classified by different formulas, the visually handicapped were divided into similar groups. Children were divided into groups according to their ages:

Elementary girls------ 10, 11, 12, 13, 14, 15
Elementary boys------ 10, 11, 12, 13, 14, 15, 16
Secondary boys ------- 17 years old and over
Secondary girls------- 16 years old and over

Three of these groups were again divided because it was assumed that there might be a difference between the best-fit classification index of the partially seeing and that of the blind. This procedure was not followed for the secondary girls because it was assumed that the correlations between performance and the factors of age, height and weight would be so low that it would be impossible to develop a valid classification formula. In Appendices R, S, and T it will be seen that this result was obtained not only for the secondary visually handicapped girls, but also for the secondary partially seeing boys and the secondary blind boys.

Three track and field events used in most schools for the blind are the standing broad jump, 50 yard dash and the basketball throw for distance. Classification indexes were computed for each group of visually handicapped children in each of these events. The computation of a classification index using factors of age, height and weight involved the solution of a four-variable problem in partial and multiple correlation techniques.[4]

Individual and best-fit classification indexes for groups of elementary school visually handicapped children are listed below. Some of the computation required to obtain the individual indexes will be found in Appendices N, O, P, and Q. In the following indexes, A refers to age in years, H to height in inches and W to weight in pounds

Partially Seeing Boys (10-16 years of age)

Running Index-- 1A + .229H + .012W
Throwing Index- 1A + .421H + .010W
Jumping Index-- 1A + .430H - .008W

Best-fit Index - 1A + .370H + .005W

Blind Boys (10-16 years of age)

Running Index-- 1A + .332H .046W
Throwing Index- 1A + .178H + .037W
Jumping Index-- 1A + .199H - .004W

Best-fit Index - 1A + .236H - .004W

Partially Seeing Girls (10-15 years of age)

Running Index-- 1A + .378H - .058W
Throwing Index- 1A + .190H + .006W
Jumping Index-- 1A + .277H - .054W

Best-fit Index - 1A + .282H - .035W

Blind Girls (10-15 years of age)

Running Index-- 1A + .052H + .033W
Throwing Index- 1A + .316H + .035W
Jumping Index-- 1A + .213H - .123W

Best-fit Index - 1A + .197H - .018W

[4]John F. Bovard, et al., Tests and Measurements in Physical Education (Philadelphia: W. B. Saunders Co., 1949), pp. 288-90.

To be truly scientific a classification plan should be devised for each year of chronological age and for each event in which the pupil competes. Such a scheme is utterly impractical from an administrative point of view and will not be considered here. There is some evidence to indicate that extremely high relationships exist between a best-fit classification scheme and specific indexes at ages below nineteen.[5] It may be assumed from this study that a best-fit classification index covering an age range of five or six years is justifiable.

Classification Plans for Various Groups of Visually Handicapped Children

After best-fit classification indexes had been obtained for various groups of visually handicapped children, it was possible

Classification Chart for Partially Seeing Boys

Derived from formula 1A (years) + .37H (inches)

Exponent	Age	Exponent	Height
10	9:6-10:5	18	49 1/2 down
11	10:6-11:5	19	50 -52 1/2
12	11:6-12:5	20	53 -55
13	12:6-13:5	21	55 1/2-58
14	13:6-14:5	22	58 1/2-60 1/2
15	14:6-15:5	23	61 -63 1/2
16	15:6-16:5	24	64 -66
		25	66 1/2-68 1/2
		26	69 -71 1/2
		27	72 over

Sum of exponents	Class	Age
	A*	17 years old and over
39 and above	B	
35-38	C	
32-34	D	
31 and below	E	

*Because of low correlations between age, height and weight and performance, all partially seeing boys 17 years old and over are placed in Class A.

[5] N. P. Neilson, A Study of Achievement in Selected Athletic Events (doctor's dissertation, University of California, 1936).

to construct classification charts for each group. Since the factors of age, height and weight seem to have little influence upon the performance of visually handicapped children of high-school age, these boys and girls were placed in Class A in their respective groups. In cases where weight represented less than one-tenth of the exponent value of each of the other factors (age and height), it was dropped from the classification plan. Little would be gained by retaining weight as a factor in the classification charts for partially seeing boys and blind boys.

Classification Chart for Blind Boys

Derived from formula 1A (years) + .236H (inches)

Exponent	Age	Height
10	9:6-10:5	
11	10:6-11:5	
12	11:6-12:5	49 -52 1/2
13	12:6-13:5	53 -57
14	13:6-14:5	57 1/2-61
15	14:6-15:5	61 1/2-65 1/2
16	15:6-16:5	66 -69 1/2
17		70 over

Sum of exponents	Class	Age
	A*	17 years old and over
30 and above	B	
27-29	C	
25-26	D	
24 and below	E	

*Because of low correlations between age, height and weight and performance, all blind boys 17 years old and over are placed in Class A.

Classification Chart for Partially Seeing Girls

Derived from 1A (years) + .282H (inches) — .035W (pounds)

Exponent	Age	Height	Weight
-2			71 down
-3			72- 99
-4			100-128
-5			129-157
-6			158 over
10	9:6-10:5		
11	10:6-11:5		
12	11:6-12:5		
13	12:6-13:5		
14	13:6-14:5	48 -51	
15	14:6-15:5	51 1/2-54 1/2	
16		55 -58 1/2	
17		59 -62	
18		62 1/2-65 1/2	
19		66 -69	
20		69 1/2 over	

Sum of exponents	Class	Age
	A*	16 years old and over
28 and above	B	
25-27	C	
24 and below	D	

*Because of low correlations between age, height and weight and performance, all partially seeing girls 16 years old and over are placed in Class A.

Classification Chart for Blind Girls

Derived from formula 1A (years) + .197H (inches) - .018W (pounds)

Exponent	Age	Height	Weight
-1			83 down
-2			84-138
-3			139 over
10	9:6-10:5	48 1/2-53	
11	10:6-11:5	53 1/2-58	
12	11:6-12:5	58 1/2-63	
13	12:6-13:5	63 1/2-68 1/2	
14	13:6-14:5	69 over	
15	14:6-15:5		

Sum of exponents	Class	Age
	A*	16 years old and over
24 and above	B	
22-23	C	
21 and below	D	

*Because of low correlations between age, height and weight and performance, all blind girls 16 years old and over are placed in Class A.

The information needed to classify pupils is usually kept up-to-date and available in most schools for the blind. The use of the charts presented above for classifying pupils is illustrated by the following examples:

Blind Boy	Exponent
Age - 13 years and 2 months	13
Height - 60 inches	14
Sum of exponents	27
Boy is in Class C	

Partially Seeing Girl	Exponent
Age - 12 years and 3 months	12
Height - 60 inches	17
Weight - 105 pounds	-4
Sum of exponents	25
Girl is in Class C	

TABLE XXX

COMPARISON OF CLASSIFICATION FORMULAS FOR SEEING AND VISUALLY HANDICAPPED CHILDREN

Group	Seeing	Visually Handicapped
Elementary boys	20A + 5.5H + 1.1W*	20A + 7.4H + .1W — partially seeing
		20A + 4.7H - .08W— blind
Elementary girls	20A + 5.5H + 1.1W*	20A + 5.6H - .7W —. partially seeing
		20A + 3.9H - .4W — blind
Secondary boys	2A + .475H + .16W†	No formula‡
Secondary girls	No formula‡	No formula‡

*N. P. Neilson and F. W. Cozens, op. cit., p. 162.

†F. W. Cozens et al., Physical Education Achievement Scales for Boys in Secondary Schools. (New York: A. S. Barnes Co., 1936), pp. 10-13.

‡Because of low correlation between performance and factors of age, height and weight, classification chart has not been developed.

Comparison of Classification Formulas for Seeing and Visually Handicapped Children

In Table XXX the best-fit indexes for the various groups of children with defective vision are multiplied by 20 so that they are comparable to the formulas used to classify seeing boys and girls. The classification of visually handicapped children differs from that of seeing students in some respects. On the elementary level a difference exists in the relative importance of weight. This factor influences performance of seeing much more than that of visually handicapped girls and boys. For partially seeing boys and for blind boys, weight is so unimportant that it is not included in the plan for classifying these pupils. A classification formula is available for seeing secondary boys, but the correlations between performance and the factors of age, height and weight are so low for visually handicapped boys of high-school age that a valid formula has not been developed.

There are some similarities between the classification schemes of seeing and visually handicapped children. Age and height have somewhat similar weightings in the classification indexes of the two groups. Because of low correlations between performance and the factors of age, height and weight valid classification indexes have not been developed for either seeing or visually handicapped girls of high-school age.

Correlation between Two Plans of Classifying Visually Handicapped Children

High relationships exist between the empirical plan now used to classify children with defective vision and the best-fit indexes developed in the present study. The correlations for boys are a little higher than those for girls. Table XXXI shows the coefficients of correlation between the two plans of classifying visually handicapped children.

TABLE XXXI

Correlation between Empirical Classification Plan for Children with Defective Vision and Best-Fit Indexes

Group	Correlation Coefficient
Partially seeing boys	.954
Blind boys	.968
Partially seeing girls	.910
Blind girls	.896

It may be assumed from these data that achievement scale scores computed for the two classification schemes will be highly related.

Chapter X

PHYSICAL EDUCATION ACHIEVEMENT SCALES FOR VISUALLY HANDICAPPED BOYS AND GIRLS

Purposes of Achievement Scales

The purposes of achievement scales are:

1. To indicate progress in various events.
2. To serve as a motivating device to improve physical conditions and to overcome weaknesses that appear.
3. To serve as a basis for a testing program which encourages the development of all-around ability.
4. To establish norms so that competition among children of dissimilar ages and heights can be equalized.
5. To provide a scientific tool for research.

One of the primary purposes in constructing the achievement scales presented here is to give the teacher and pupil an accurate measuring device in some events common in the activities of the visually handicapped. If the proper use is made of a testing program, teaching will be made more meaningful and concrete for the teacher and pupils. Pupils can be encouraged to increase their proficiency in athletic events. A student is interested in comparing his performance with his previous records and with the records of other students. He is interested in knowing whether he is above or below the average in a particular event.

Since the visually handicapped are so widely scattered, the question is frequently asked where a particular school or individual stands in relation to the physical achievement of those with defective vision in other states. The achievement scales presented here will enable the physical education teacher to better evaluate a part of his program.

Need for Revision of Certain Achievement Scales for the Visually Handicapped

Some of the achievement scales published by Buell[1] in Sports for the Blind are in need of revision. Some of the

[1]Charles E. Buell, Sports for the Blind (New York: American Foundation for the Blind, 1947), pp. 195-219.

comparisons made in earlier chapters of the present study are based upon the scales for the 50 yard dash, standing broad jump, and basketball throw for distance listed in Sports for the Blind. In general, the means obtained from these scales are far below 50 points. This indicates that these scales are too difficult for the representative sample of visually handicapped boys and girls used in the present study. The scales for the three events in Buell's earlier work are based upon means obtained from performances in the National Athletic Association of Schools for the Blind which is not a representative sample according to the present study.

Data presented in Chapter VI indicate that separate scales should be constructed for the blind and the partially seeing in the 50 yard dash, the basketball throw for distance, and the standing broad jump. In his earlier work Buell[2] assumed that a classification chart developed for seeing children would also be valid for visually handicapped boys and girls. In Chapter IX a classification plan is presented which better meets the needs of those with defective vision. The revisions referred to above are included in the achievement scales presented here.

Construction of the Achievement Scales

The performance records of the 865 visually handicapped pupils participating in the present study were segregated according to their classifications as shown in Chapter IX. Means and standard deviations of each distribution were computed. The mean was set at a score of 50, while the 0 and 100 points were placed three standard deviations below and above the mean. Due to skewed distributions in some of the events, particularly the 50 yard dash, it was deemed advisable to estimate the size of the standard deviation which would fit the range of the distribution below the mean, and one which would fit the range above the mean. This explains the difference in score values above and below the mean in some of the scales. This seems to be the only practical method to adequately cover the range of performance in certain events for the visually handicapped.

Performance in most of the boys' events increases rather regularly as pupils grow older and taller. Since the number

[2]Buell, op. cit., p. 188.

in some of the classes is small (not less than twenty-six) it seems that a straight line of best-fit to the means of performance in each event would more truly represent the actual manner in which performance increases than would the means computed separately for the several classes. To illustrate the method used, an example is shown in Figure I. In some events the standard deviations increase or decrease rather regularly from class to class. These standard deviations were plotted, and the line of best-fit was drawn as in the case of the means. Where standard deviations were found to be fairly uniform, or where no trend was evident, the average was used.

In comparison with achievement scales for seeing children, the scales for those with defective vision cover a wider range of performance. The standard deviations used to construct the scales for the visually handicapped were almost always larger than those for seeing boys and girls. In the scales presented here there is a tendency for the range of performance below the mean to exceed that above the mean. This seems to be particularly true of the blind.

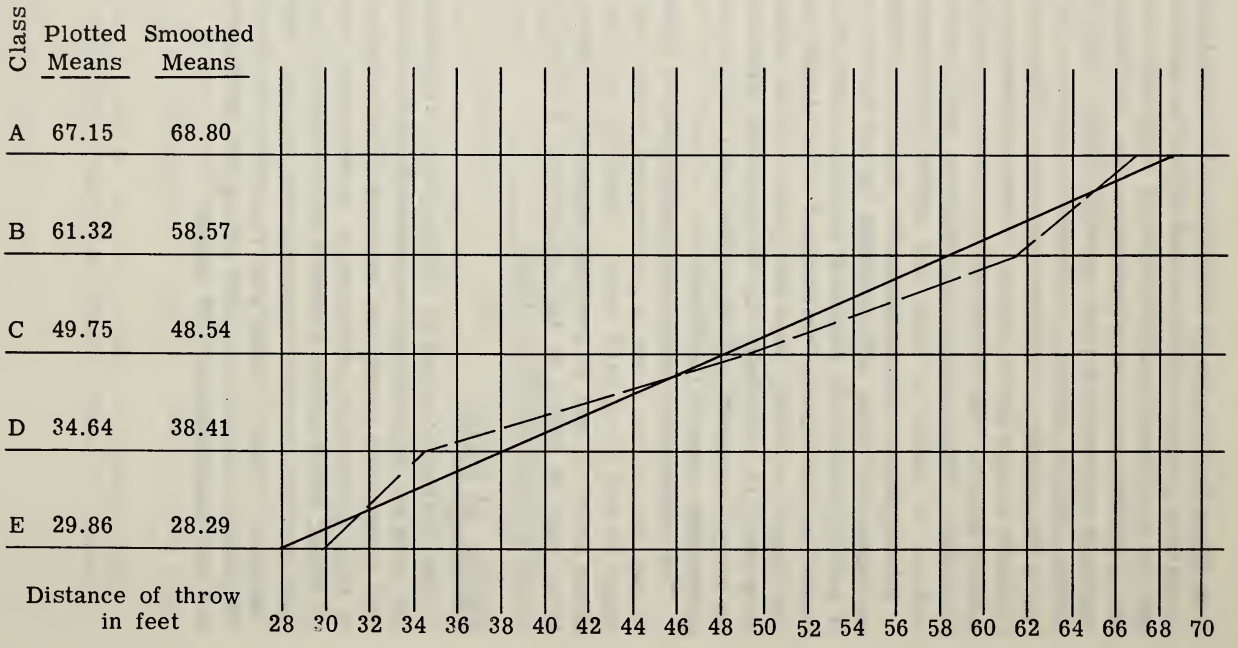
The achievement scales are constructed in a manner that 77 per cent of the visually handicapped pupils should score between 30 and 70 in each event. About 27 per cent should score above 60 and 27 per cent below 40. Those scoring lower than 40 points on the achievement scales presented here should receive special training.

Reading the Scales

The scales are read by knowing the classification of the boy or girl and locating the performance in the class column. The score to be given will be found directly opposite either to the right or left. If the exact performance record cannot be found, find the next lowest record listed in the achievement scale and use the score opposite that record. Here are some examples: Class B blind girl runs 50 yards in 10.2 seconds - 30 points. Class D partially seeing boy standing broad jumps six feet eleven inches - 72 points.

Figure 1

Showing Method of Smoothing Means —
Partially Seeing Boys' Basketball Throw for Distance



BASKETBALL THROW FOR DISTANCE (PARTIALLY SEEING BOYS)

Distance in feet

Classes

Score	A	B	C	D	E	Score
100	121	105	88	71	55	100
98	118	103	86	69	53	98
96	116	101	84	68	52	96
94	114	99	83	67	51	94
92	112	97	81	65	50	92
90	110	95	80	64	49	90
88	108	93	78	63	48	88
86	106	92	77	61	47	86
84	104	90	75	60	46	84
82	102	88	73	59	45	82
80	100	86	72	57	44	80
78	98	84	70	56	43	78
76	96	82	69	55	42	76
74	93	81	67	53	40	74
72	91	79	66	52	39	72
70	89	77	64	51	38	70
68	87	75	63	49	37	68
66	85	73	61	48	36	66
64	83	71	59	47	35	64
62	81	70	58	45	34	62
60	79	68	56	44	33	60
58	77	66	55	43	32	58
56	75	64	53	41	31	56
54	73	62	52	40	30	54
52	71	60	50	39	29	52
50	69	59	49	38	28	50
48	66	57	47	36	26	48
46	64	55	45	35	25	46
44	62	53	44	34	24	44
42	60	51	42	32	23	42
40	58	49	41	31	22	40
38	56	47	39	30	21	38
36	54	46	38	28	20	36
34	52	44	36	27	19	34
32	50	42	34	26	18	32
30	48	40	33	24	17	30
28	46	38	31	23	16	28
26	44	36	30	22	15	26
24	41	35	28	20	13	24
22	39	33	27	19	12	22
20	37	31	25	18	11	20
18	35	29	24	16	10	18
16	33	27	22	15	9	16
14	31	25	20	14	8	14
12	29	24	19	12	7	12
10	27	22	17	11	6	10
8	25	20	16	10	5	8
6	23	18	14	8	4	6
4	21	16	13	7	3	4
2	19	14	11	6	2	2

RUN — 50 YARDS (PARTIALLY SEEING BOYS)

Time in seconds and tenths

Classes

Score	A	B	C	D	E	Score
100	5.3	5.6	6.0	6.5	7.0	100
98	5.4	5.7	6.1	6.6	7.1	98
96	---	---	6.2	6.7	7.2	96
94	5.5	5.8	---	---	---	94
92	---	5.9	6.3	6.8	7.3	92
90	5.6	6.0	6.4	6.9	7.4	90
88	5.7	---	6.5	7.0	7.5	88
86	---	6.1	---	7.1	7.6	86
84	5.8	6.2	6.6	---	---	84
82	---	---	6.7	7.2	7.7	82
80	5.9	6.3	6.8	7.3	7.8	80
78	6.0	6.4	---	7.4	7.9	78
76	---	6.5	6.9	7.5	8.0	76
74	6.1	---	7.0	---	---	74
72	---	6.6	7.1	7.6	8.1	72
70	6.2	6.7	---	7.7	8.2	70
68	6.3	6.8	7.2	7.8	8.3	68
66	---	---	7.3	7.9	8.4	66
64	6.4	6.9	7.4	---	---	64
62	---	7.0	---	8.0	8.5	62
60	6.5	---	7.5	8.1	8.6	60
58	6.6	7.1	7.6	8.2	8.7	58
56	---	7.2	7.7	8.3	8.8	56
54	6.7	7.3	---	---	---	54
52	---	---	7.8	8.4	8.9	52
50	6.8	7.4	7.9	8.5	9.0	50
48	6.9	7.5	8.0	8.6	9.1	48
46	7.0	7.6	8.1	8.7	9.3	46
44	7.1	7.7	8.2	8.9	9.4	44
42	7.2	7.8	8.4	9.0	9.5	42
40	7.3	7.9	8.5	9.1	9.6	40
38	7.4	8.0	8.6	9.2	9.8	38
36	7.5	8.2	8.7	9.3	9.9	36
34	7.6	8.3	8.8	9.5	10.0	34
32	7.7	8.4	8.9	9.6	10.2	32
30	7.8	8.5	9.1	9.7	10.3	30
28	7.9	8.6	9.2	9.8	10.4	28
26	8.0	8.7	9.3	9.9	10.5	26
24	8.1	8.8	9.4	10.1	10.7	24
22	8.2	8.9	9.5	10.2	10.8	22
20	8.3	9.0	9.6	10.3	10.9	20
18	8.4	9.1	9.8	10.4	11.0	18
16	8.5	9.2	9.9	10.5	11.2	16
14	8.6	9.3	10.0	10.7	11.3	14
12	8.7	9.5	10.1	10.8	11.4	12
10	8.8	9.6	10.2	10.9	11.6	10
8	8.9	9.7	10.3	11.0	11.7	8
6	9.0	9.8	10.5	11.1	11.8	6
4	9.1	9.9	10.6	11.3	11.9	4
2	9.2	10.0	10.7	11.4	12.1	2

STANDING BROAD JUMP (PARTIALLY SEEING BOYS)

Distance in feet and inches

Classes

Score	A	B	C	D	E	Score
100	10-9	10-0	9-3	8-6	7-9	100
98	10-7	9-10	9-1	8-4	7-7	98
96	10-6	9-9	9-0	8-3	7-6	96
94	10-4	9-7	8-10	8-1	7-5	94
92	10-3	9-6	8-9	8-0	7-3	92
90	10-2	9-5	8-8	7-11	7-2	90
88	10-0	9-3	8-6	7-9	7-1	88
86	9-11	9-2	8-5	7-8	6-11	86
84	9-9	9-0	8-4	7-7	6-10	84
82	9-8	8-11	8-2	7-5	6-9	82
80	9-7	8-10	8-1	7-4	6-7	80
78	9-5	8-8	8-0	7-3	6-6	78
76	9-4	8-7	7-10	7-1	6-5	76
74	9-2	8-5	7-9	7-0	6-3	74
72	9-1	8-4	7-7	6-10	6-2	72
70	9-0	8-3	7-6	6-9	6-1	70
68	8-10	8-1	7-5	6-8	5-11	68
66	8-9	8-0	7-3	6-6	5-10	66
64	8-7	7-10	7-2	6-5	5-9	64
62	8-6	7-9	7-1	6-4	5-7	62
60	8-5	7-8	6-11	6-2	5-6	60
58	8-3	7-6	6-10	6-1	5-5	58
56	8-2	7-5	6-9	6-0	5-3	56
54	8-0	7-3	6-7	5-10	5-2	54
52	7-11	7-2	6-6	5-9	5-1	52
50	7-10	7-1	6-5	5-8	5-0	50
48	7-8	6-11	6-3	5-6	4-10	48
46	7-6	6-9	6-1	5-4	4-9	46
44	7-4	6-8	6-0	5-3	4-7	44
42	7-3	6-6	5-10	5-1	4-6	42
40	7-1	6-4	5-9	5-0	4-4	40
38	6-11	6-3	5-7	4-10	4-3	38
36	6-10	6-1	5-5	4-9	4-2	36
34	6-8	6-0	5-4	4-7	4-0	34
32	6-6	5-10	5-2	4-6	3-11	32
30	6-5	5-8	5-1	4-4	3-9	30
28	6-3	5-7	4-11	4-3	3-8	28
26	6-1	5-5	4-10	4-1	3-6	26
24	5-11	5-3	4-8	4-0	3-5	24
22	5-10	5-2	4-6	3-10	3-3	22
20	5-8	5-0	4-5	3-9	3-2	20
18	5-6	4-11	4-3	3-7	3-0	18
16	5-5	4-9	4-2	3-6	2-11	16
14	5-3	4-7	4-0	3-4	2-10	14
12	5-1	4-6	3-11	3-3	2-8	12
10	5-0	4-4	3-9	3-1	2-7	10
8	4-10	4-2	3-7	3-0	2-5	8
6	4-8	4-1	3-6	2-10	2-4	6
4	4-6	3-11	3-4	2-9	2-2	4
2	4-5	3-10	3-3	2-7	2-1	2

BASKETBALL THROW FOR DISTANCE (BLIND BOYS)

Distance to the nearest half-foot

Classes

Score	A	B	C	D	E	Score
100	106 1/2	90 1/2	74	57 1/2	42	100
98	105	89	73	56 1/2	41	98
96	103	87	71 1/2	55 1/2	40 1/2	96
94	101 1/2	85 1/2	70	54 1/2	39 1/2	94
92	99 1/2	84	68 1/2	53 1/2	38 1/2	92
90	97 1/2	82 1/2	67 1/2	52 1/2	38	90
88	96	81	66	51	37	88
86	94	79	64 1/2	50	36	86
84	92	77 1/2	63 1/2	49	35 1/2	84
82	90	76	62	48	34 1/2	82
80	88 1/2	74 1/2	60 1/2	47	33 1/2	80
78	86 1/2	73	59 1/2	46	33	78
76	84 1/2	71	58	44 1/2	32	76
74	83	69 1/2	56 1/2	43 1/2	31	74
72	81	68	55	42 1/2	30	72
70	79	66 1/2	54	41 1/2	29 1/2	70
68	77 1/2	65	52 1/2	40 1/2	28 1/2	68
66	75 1/2	63	51	39 1/2	27 1/2	66
64	73 1/2	61 1/2	50	38	27	64
62	71 1/2	60	48 1/2	37	26	62
60	70	58 1/2	47	36	25	60
58	68	57	46	35	24 1/2	58
56	66	55	44 1/2	34	23 1/2	56
54	64 1/2	53 1/2	43	33	22 1/2	54
52	62 1/2	52	41 1/2	31 1/2	22	52
50	60 1/2	50 1/2	40 1/2	30 1/2	21	50
48	59	49	39	29 1/2	20	48
46	57	47	37 1/2	28 1/2	19 1/2	46
44	55	45 1/2	36 1/2	27 1/2	18 1/2	44
42	53	44	35	26	17 1/2	42
40	51 1/2	42 1/2	33 1/2	25	16 1/2	40
38	49 1/2	41	32 1/2	24	16	38
36	47 1/2	39	31	23	15	36
34	45 1/2	37 1/2	29 1/2	21 1/2	14	34
32	44	36	28	20 1/2	13 1/2	32
30	42	34 1/2	27	19 1/2	12 1/2	30
28	40	33	25 1/2	18 1/2	11 1/2	28
26	38	31	24	17	10 1/2	26
24	36 1/2	29 1/2	23	16	9 1/2	24
22	34 1/2	28	21 1/2	15	9	22
20	32 1/2	26 1/2	20	14	8	20
18	30 1/2	25	19	12 1/2	7	18
16	29	23	17 1/2	11 1/2	6 1/2	16
14	27	21 1/2	16	10 1/2	5 1/2	14
12	25	20	14 1/2	9 1/2	4 1/2	12
10	23	18 1/2	13 1/2	8	3 1/2	10
8	21 1/2	17	12	7	3	8
6	19 1/2	15	10 1/2	6	2	6
4	17 1/2	13 1/2	9 1/2	5	1	4
2	16	12	8	4	1/2	2

RUN — 50 YARDS (BLIND BOYS)

Time in seconds and tenths

Classes

Score	A	B	C	D	E	Score
100	5.8	6.1	6.6	7.0	7.6	100
98	---	6.2	6.7	7.1	7.7	98
96	5.9	6.3	6.8	7.2	7.9	96
94	6.0	---	---	7.3	8.0	94
92	---	6.4	6.9	7.4	8.1	92
90	6.1	6.5	7.0	7.5	8.2	90
88	6.2	6.6	7.1	7.6	8.3	88
86	---	---	7.2	7.7	8.5	86
84	6.3	6.7	7.3	7.8	8.6	84
82	6.4	6.8	7.4	7.9	8.7	82
80	---	---	---	8.0	8.8	80
78	6.5	6.9	7.5	8.1	8.9	78
76	6.6	7.0	7.6	8.2	9.1	76
74	---	7.1	7.7	8.4	9.2	74
72	6.7	---	7.8	8.5	9.3	72
70	6.8	7.2	7.9	8.6	9.4	70
68	---	7.3	---	8.7	9.5	68
66	6.9	7.4	8.0	8.8	9.7	66
64	7.0	---	8.1	8.9	9.8	64
62	---	7.5	8.2	9.0	9.9	62
60	7.1	7.6	8.3	9.1	10.0	60
58	7.2	---	8.4	9.2	10.1	58
56	---	7.7	8.5	9.3	10.3	56
54	7.3	7.8	---	9.4	10.4	54
52	7.4	7.9	8.6	9.5	10.5	52
50	7.5	8.0	8.7	9.6	10.6	50
48	7.6	8.1	8.8	9.7	10.7	48
46	7.7	8.2	8.9	9.8	10.8	46
44	7.8	8.3	9.0	9.9	10.9	44
42	8.0	8.5	9.2	10.1	11.1	42
40	8.1	8.6	9.3	10.2	11.2	40
38	8.2	8.7	9.4	10.3	11.3	38
36	8.3	8.8	9.5	10.4	11.4	36
34	8.4	8.9	9.6	10.5	11.5	34
32	8.6	9.1	9.8	10.7	11.7	32
30	8.7	9.2	9.9	10.8	11.8	30
28	8.8	9.3	10.0	10.9	11.9	28
26	8.9	9.4	10.1	11.0	12.0	26
24	9.0	9.5	10.2	11.1	12.1	24
22	9.2	9.7	10.4	11.3	12.3	22
20	9.3	9.8	10.5	11.4	12.4	20
18	9.4	9.9	10.6	11.5	12.5	18
16	9.5	10.0	10.7	11.6	12.6	16
14	9.6	10.1	10.8	11.7	12.7	14
12	9.8	10.3	11.0	11.9	12.9	12
10	9.9	10.4	11.1	12.0	13.0	10
8	10.0	10.5	11.2	12.1	13.1	8
6	10.1	10.6	11.3	12.2	13.2	6
4	10.2	10.7	11.4	12.3	13.3	4
2	10.4	10.9	11.6	12.5	13.5	2

STANDING BROAD JUMP (BLIND BOYS)

Distance in feet and inches

Classes

Score	A	B	C	D	E	Score
100	10-2	9-7	8-10	7-11	7-0	100
98	10-1	9-6	8-9	7-10	6-11	98
96	9-11	9-4	8-7	7-8	6-9	96
94	9-10	9-3	8-6	7-7	6-8	94
92	9-9	9-2	8-5	7-6	6-7	92
90	9-8	9-1	8-4	7-5	6-6	90
88	9-7	9-0	8-3	7-4	6-5	88
86	9-5	8-10	8-1	7-2	6-3	86
84	9-4	8-9	8-0	7-1	6-2	84
82	9-3	8-8	7-11	7-0	6-1	82
80	9-2	8-7	7-10	6-11	6-0	80
78	9-1	8-6	7-9	6-10	5-11	78
76	8-11	8-4	7-7	6-8	5-9	76
74	8-10	8-3	7-6	6-7	5-8	74
72	8-9	8-2	7-5	6-6	5-7	72
70	8-8	8-1	7-4	6-5	5-6	70
68	8-7	8-0	7-2	6-4	5-5	68
66	8-5	7-10	7-1	6-2	5-3	66
64	8-4	7-9	7-0	6-1	5-2	64
62	8-3	7-8	6-11	6-0	5-1	62
60	8-2	7-7	6-10	5-11	5-0	60
58	8-1	7-6	6-9	5-10	4-11	58
56	8-0	7-5	6-8	5-9	4-10	56
54	7-10	7-3	6-6	5-7	4-8	54
52	7-9	7-2	6-5	5-6	4-7	52
50	7-8	7-1	6-4	5-5	4-6	50
48	7-6	6-11	6-3	5-4	4-5	48
46	7-5	6-10	6-1	5-2	4-4	46
44	7-3	6-8	6-0	5-1	4-2	44
42	7-1	6-7	5-11	5-0	4-1	42
40	7-0	6-5	5-9	4-11	4-0	40
38	6-10	6-4	5-8	4-9	3-11	38
36	6-9	6-3	5-7	4-8	3-9	36
34	6-7	6-1	5-5	4-7	3-8	34
32	6-6	6-0	5-4	4-5	3-7	32
30	6-4	5-10	5-3	4-4	3-6	30
28	6-2	5-9	5-1	4-3	3-4	28
26	6-1	5-7	5-0	4-1	3-3	26
24	5-11	5-6	4-11	4-0	3-2	24
22	5-10	5-4	4-9	3-11	3-1	22
20	5-8	5-3	4-8	3-10	2-11	20
18	5-7	5-2	4-7	3-8	2-10	18
16	5-5	5-0	4-6	3-7	2-9	16
14	5-3	4-11	4-4	3-6	2-8	14
12	5-2	4-9	4-3	3-4	2-6	12
10	5-0	4-8	4-1	3-3	2-5	10
8	4-11	4-6	4-0	3-2	2-4	8
6	4-9	4-5	3-11	3-1	2-3	6
4	4-8	4-3	3-9	2-11	2-1	4
2	4-6	4-2	3-8	2-10	2-0	2

BASKETBALL THROW FOR DISTANCE (PARTIALLY SEEING BOYS)

Distance in feet

Classes

Score	A	B	C	D	E	Score
100	121	105	88	71	55	100
98	118	103	86	69	53	98
96	116	101	84	68	52	96
94	114	99	83	67	51	94
92	112	97	81	65	50	92
90	110	95	80	64	49	90
88	108	93	78	63	48	88
86	106	92	77	61	47	86
84	104	90	75	60	46	84
82	102	88	73	59	45	82
80	100	86	72	57	44	80
78	98	84	70	56	43	78
76	96	82	69	55	42	76
74	93	81	67	53	40	74
72	91	79	66	52	39	72
70	89	77	64	51	38	70
68	87	75	63	49	37	68
66	85	73	61	48	36	66
64	83	71	59	47	35	64
62	81	70	58	45	34	62
60	79	68	56	44	33	60
58	77	66	55	43	32	58
56	75	64	53	41	31	56
54	73	62	52	40	30	54
52	71	60	50	39	29	52
50	69	59	49	38	28	50
48	66	57	47	36	26	48
46	64	55	45	35	25	46
44	62	53	44	34	24	44
42	60	51	42	32	23	42
40	58	49	41	31	22	40
38	56	47	39	30	21	38
36	54	46	38	28	20	36
34	52	44	36	27	19	34
32	50	42	34	26	18	32
30	48	40	33	24	17	30
28	46	38	31	23	16	28
26	44	36	30	22	15	26
24	41	35	28	20	13	24
22	39	33	27	19	12	22
20	37	31	25	18	11	20
18	35	29	24	16	10	18
16	33	27	22	15	9	16
14	31	25	20	14	8	14
12	29	24	19	12	7	12
10	27	22	17	11	6	10
8	25	20	16	10	5	8
6	23	18	14	8	4	6
4	21	16	13	7	3	4
2	19	14	11	6	2	2

RUN — 50 YARDS (PARTIALLY SEEING GIRLS)

Time in seconds and tenths

Classes

Score	A	B	C	D	Score
100	6.6	6.2	6.6	7.6	100
98	---	---	---	---	98
96	6.7	6.3	6.7	7.7	96
94	6.8	6.4	6.8	7.8	94
92	6.9	6.5	6.9	7.9	92
90	---	---	---	---	90
88	7.0	6.6	7.0	8.0	88
86	7.1	6.7	7.1	8.1	86
84	7.2	6.8	7.2	8.2	84
82	7.3	6.9	7.3	8.3	82
80	---	---	---	---	80
78	7.4	7.0	7.4	8.4	78
76	7.5	7.1	7.5	8.5	76
74	7.6	7.2	7.6	8.6	74
72	7.7	7.3	7.7	8.7	72
70	---	---	---	---	70
68	7.8	7.4	7.8	8.8	68
66	7.9	7.5	7.9	8.9	66
64	8.0	7.6	8.0	9.0	64
62	8.1	7.7	8.1	9.1	62
60	---	---	---	---	60
58	8.2	7.8	8.2	9.2	58
56	8.3	7.9	8.3	9.3	56
54	8.4	8.0	8.4	9.4	54
52	8.5	8.1	8.5	9.5	52
50	8.6	8.2	8.6	9.6	50
48	8.7	8.3	8.7	9.7	48
46	8.8	8.4	8.8	9.8	46
44	8.9	8.5	8.9	9.9	44
42	9.0	8.6	9.0	10.0	42
40	9.1	8.7	9.1	10.1	40
38	9.3	8.9	9.3	10.3	38
36	9.4	9.0	9.4	10.4	36
34	9.5	9.1	9.5	10.5	34
32	9.6	9.2	9.6	10.6	32
30	9.7	9.3	9.7	10.7	30
28	9.8	9.4	9.8	10.8	28
26	9.9	9.5	9.9	10.9	26
24	10.0	9.6	10.0	11.0	24
22	10.1	9.7	10.1	11.1	22
20	10.2	9.8	10.2	11.2	20
18	10.3	9.9	10.3	11.3	18
16	10.4	10.0	10.4	11.4	16
14	10.6	10.2	10.6	11.6	14
12	10.7	10.3	10.7	11.7	12
10	10.8	10.4	10.8	11.8	10
8	10.9	10.5	10.9	11.9	8
6	11.0	10.6	11.0	12.0	6
4	11.1	10.7	11.1	12.1	4
2	11.3	10.9	11.3	12.3	2

STANDING BROAD JUMP (PARTIALLY SEEING GIRLS)

Distance in feet and inches

Classes

Score	A	B	C	D	Score
100	7-8	7-11	7-6	6-8	100
98	7-7	7-10	7-5	6-7	98
96	7-6	7-9	7-4	6-6	96
94	7-5	7-8	7-3	6-5	94
92	7-4	7-7	7-2	6-4	92
90	7-3	7-6	7-1	6-3	90
88	7-2	7-5	7-0	6-2	88
86	7-1	7-4	6-11	6-1	86
84	7-0	7-3	6-10	6-0	84
82	6-11	7-2	6-9	5-11	82
80	6-10	7-1	6-8	5-10	80
78	6-9	7-0	6-7	5-9	78
76	6-8	6-11	6-6	5-8	76
74	6-7	6-10	6-5	5-7	74
72	6-6	6-9	6-4	5-6	72
70	6-5	6-8	6-3	5-5	70
68	6-4	6-7	6-2	5-4	68
66	6-3	6-6	6-1	5-3	66
64	6-2	6-5	6-0	5-2	64
62	6-1	6-4	5-11	5-1	62
60	6-0	6-3	5-10	5-0	60
58	5-11	6-2	5-9	4-11	58
56	5-10	6-1	5-8	4-10	56
54	5-9	6-0	5-7	4-9	54
52	5-8	5-11	5-6	4-8	52
50	5-7	5-10	5-5	4-7	50
48	5-5	5-8	5-3	4-6	48
46	5-4	5-7	5-2	4-5	46
44	5-3	5-6	5-1	4-4	44
42	5-1	5-4	4-11	4-2	42
40	5-0	5-3	4-10	4-1	40
38	4-11	5-2	4-9	4-0	38
36	4-9	5-0	4-7	3-11	36
34	4-8	4-11	4-6	3-10	34
32	4-7	4-10	4-5	3-8	32
30	4-5	4-8	4-3	3-7	30
28	4-4	4-7	4-2	3-6	28
26	4-3	4-6	4-1	3-5	26
24	4-1	4-4	3-11	3-4	24
22	4-0	4-3	3-10	3-2	22
20	3-11	4-2	3-9	3-1	20
18	3-9	4-0	3-7	3-0	18
16	3-8	3-11	3-6	2-11	16
14	3-7	3-10	3-5	2-10	14
12	3-5	3-8	3-3	2-8	12
10	3-4	3-7	3-2	2-7	10
8	3-3	3-6	3-1	2-6	8
6	3-1	3-4	2-11	2-5	6
4	3-0	3-3	2-10	2-4	4
2	2-11	3-2	2-9	2-2	2

BASKETBALL THROW FOR DISTANCE (BLIND GIRLS)

Distance to the nearest half-foot

Classes

Score	A	B	C	D	Score
100	47 1/2	54 1/2	49 1/2	31	100
98	47	54	49	30 1/2	98
96	46	53	48	29 1/2	96
94	45	52	47	29	94
92	44 1/2	51 1/2	46 1/2	28	92
90	43 1/2	50 1/2	45 1/2	27 1/2	90
88	42 1/2	49 1/2	44 1/2	26 1/2	88
86	42	49	44	26	86
84	41	48	43	25	84
82	40	47	42	24 1/2	82
80	39 1/2	46 1/2	41 1/2	23 1/2	80
78	38 1/2	45 1/2	40 1/2	23	78
76	37 1/2	44 1/2	39 1/2	22	76
74	37	44	39	21 1/2	74
72	36	43	38	20 1/2	72
70	35	42	37	20	70
68	34 1/2	41 1/2	36 1/2	19	68
66	33 1/2	40 1/2	35 1/2	18 1/2	66
64	32 1/2	39 1/2	34 1/2	17 1/2	64
62	32	39	34	17	62
60	31	38	33	16	60
58	30	37	32	15 1/2	58
56	29 1/2	36 1/2	31 1/2	14 1/2	56
54	28 1/2	35 1/2	30 1/2	14	54
52	27 1/2	34 1/2	29 1/2	13	52
50	27	34	29	12 1/2	50
48	26	33	28	12	48
46	25	32	27	11 1/2	46
44	24 1/2	31 1/2	26 1/2	11	44
42	23 1/2	30 1/2	25 1/2	10 1/2	42
40	22 1/2	29 1/2	24 1/2	10	40
38	22	29	24	9 1/2	38
36	21	28	23	9	36
34	20	27	22	8 1/2	34
32	19 1/2	26 1/2	21 1/2	8	32
30	18 1/2	25 1/2	20 1/2	7 1/2	30
28	17 1/2	24 1/2	19 1/2	7	28
26	17	24	19	6 1/2	26
24	16	23	18	6	24
22	15	22	17	5 1/2	22
20	14 1/2	21 1/2	16 1/2	5	20
18	13 1/2	20 1/2	15 1/2	4 1/2	18
16	12 1/2	19 1/2	14 1/2	4	16
14	12	19	14	3 1/2	14
12	11	18	13	3	12
10	10	17	12	2 1/2	10
8	9 1/2	16 1/2	11 1/2	2	8
6	8 1/2	15 1/2	10 1/2	1 1/2	6
4	7 1/2	14 1/2	9 1/2	1	4
2	7	14	9	1/2	2

RUN — 50 YARDS (BLIND GIRLS)

Time in seconds and tenths

Classes

Score	A	B	C	D	Score
100	7.3	6.9	7.1	8.5	100
98	7.4	7.0	7.2	8.7	98
96	7.5	7.1	7.3	8.8	96
94	7.6	---	7.4	8.9	94
92	7.7	7.2	7.5	9.0	92
90	---	7.3	---	9.1	90
88	7.8	7.4	7.6	9.2	88
86	7.9	7.5	7.7	9.3	86
84	8.0	7.6	7.8	9.5	84
82	8.1	---	7.9	9.6	82
80	8.2	7.7	8.0	9.7	80
78	8.3	7.8	8.1	9.8	78
76	---	7.9	---	9.9	76
74	8.4	8.0	8.2	10.0	74
72	8.5	8.1	8.3	10.1	72
70	8.6	---	8.4	10.2	70
68	8.7	8.2	8.5	10.3	68
66	8.8	8.3	8.6	10.5	66
64	---	8.4	---	10.6	64
62	8.9	8.5	8.7	10.7	62
60	9.0	8.6	8.8	10.8	60
58	9.1	---	8.9	10.9	58
56	9.2	8.7	9.0	11.0	56
54	9.3	8.8	9.1	11.1	54
52	9.4	8.9	9.2	11.2	52
50	9.5	9.0	9.3	11.3	50
48	9.6	9.1	9.4	11.4	48
46	9.7	9.2	9.5	11.5	46
44	9.8	9.3	9.6	11.7	44
42	10.0	9.5	9.8	11.8	42
40	10.1	9.6	9.9	11.9	40
38	10.2	9.7	10.0	12.0	38
36	10.3	9.8	10.1	12.1	36
34	10.4	9.9	10.2	12.3	34
32	10.6	10.1	10.4	12.4	32
30	10.7	10.2	10.5	12.5	30
28	10.8	10.3	10.6	12.6	28
26	10.9	10.4	10.7	12.7	26
24	11.0	10.5	10.8	12.9	24
22	11.2	10.7	11.0	13.0	22
20	11.3	10.8	11.1	13.1	20
18	11.4	10.9	11.2	13.2	18
16	11.5	11.0	11.3	13.3	16
14	11.6	11.1	11.4	13.5	14
12	11.8	11.3	11.6	13.6	12
10	11.9	11.4	11.7	13.7	10
8	12.0	11.5	11.8	13.8	8
6	12.1	11.6	11.9	13.9	6
4	12.2	11.7	12.0	14.1	4
2	12.4	11.9	12.2	14.2	2

STANDING BROAD JUMP (BLIND GIRLS)

Distance in feet and inches

Classes

Score	A	B	C	D	Score
100	7-7	7-9	7-6	6-3	100
98	7-5	7-8	7-4	6-1	98
96	7-4	7-7	7-3	6-0	96
94	7-3	7-6	7-2	5-11	94
92	7-2	7-5	7-1	5-10	92
90	7-1	7-4	7-0	5-9	90
88	7-0	7-3	6-11	5-8	88
86	6-11	7-2	6-10	5-7	86
84	6-10	7-1	6-9	5-6	84
82	6-9	7-0	6-8	5-5	82
80	6-8	6-11	6-7	5-4	80
78	6-7	6-10	6-6	5-3	78
76	6-6	6-9	6-5	5-2	76
74	6-4	6-8	6-3	5-0	74
72	6-3	6-7	6-2	4-11	72
70	6-2	6-6	6-1	4-10	70
68	6-1	6-5	6-0	4-9	68
66	6-0	6-4	5-11	4-8	66
64	5-11	6-3	5-10	4-7	64
62	5-10	6-2	5-9	4-6	62
60	5-9	6-1	5-8	4-5	60
58	5-8	6-0	5-7	4-4	58
56	5-7	5-11	5-6	4-3	56
54	5-6	5-10	5-5	4-2	54
52	5-5	5-9	5-4	4-1	52
50	5-4	5-8	5-3	4-0	50
48	5-2	5-6	5-1	3-11	48
46	5-1	5-5	5-0	3-10	46
44	5-0	5-4	4-11	3-9	44
42	4-10	5-2	4-9	3-7	42
40	4-9	5-1	4-8	3-6	40
38	4-8	5-0	4-7	3-5	38
36	4-6	4-10	4-5	3-4	36
34	4-5	4-9	4-4	3-3	34
32	4-4	4-8	4-3	3-1	32
30	4-2	4-6	4-1	3-0	30
28	4-1	4-5	4-0	2-11	28
26	4-0	4-4	3-11	2-10	26
24	3-10	4-2	3-9	2-9	24
22	3-9	4-1	3-8	2-7	22
20	3-8	4-0	3-7	2-6	20
18	3-6	3-10	3-5	2-5	18
16	3-5	3-9	3-4	2-4	16
14	3-4	3-8	3-3	2-3	14
12	3-2	3-6	3-1	2-1	12
10	3-1	3-5	3-0	2-0	10
8	3-0	3-4	2-11	1-11	8
6	2-10	3-2	2-9	1-10	6
4	2-9	3-1	2-8	1-9	4
2	2-8	3-0	2-7	1-7	2

Chapter XI

SUMMARY AND CONCLUSIONS

Summary

This study has attempted to measure gross motor performance of blind and partially seeing children by means of a battery of tests, including the 50 yard dash, basketball throw for distance, standing broad jump, and the Iowa Brace Test. About one fifth of all children over ten years of age in schools and classes for the blind were included in the study. The writer gave the tests to 865 children in twelve residential schools and eight Braille classes. This is the largest and most representative sample ever obtained for research in motor performance of the visually handicapped.

The normative-survey method was used in this study, and some consideration was given to such causal relations as amount of vision, duration of visual handicap, physical education, and attitude of parents toward their children. Mean performances of the visually handicapped were compared with norms for seeing children. Comparisons were made by obtaining means, standard deviations, probable errors, and significance of differences of the means.

Information concerning age, height, and weight of pupils was obtained from school records. From conferences with pupils and members of the school staff, information on the duration of visual handicap, amount of vision, and attitude of parents toward their children, was obtained.

The amount of vision was interpreted here in terms of usefulness. Those with enough vision to see sidewalks and follow them easily were classified as partially seeing, while children with no useful vision were listed as blind. The sample was representative of the total population in schools for the blind, in that 36 per cent of the children had no useful vision. One fourth of the blind children lost their vision after six years of age.

Ages of the boys and girls taking part in the study were fairly well distributed. More than half of the pupils had attended a special school for at least six years. Classified as

overprotected were 27 per cent of the blind and 11 per cent of the partially seeing.

Due to the educational lag of children in schools for the blind, chronological age, rather than academic level, was the basis for dividing the group taking the Iowa Brace Test. The effect of giving an extra trial in these tests was studied.

Using the factors of age, height and weight, best-fit classification indexes were obtained by solving four-variable problems in partial and multiple correlation techniques. From the best-fit indexes, four classification charts were constructed for various groups of visually handicapped children--partially seeing boys, blind boys, partially seeing girls, and blind girls. The charts for girls include the factors of age, height and weight, while those for boys are based on age and height. In each classification scheme the weightings of these factors are different.

Achievement scales were used to equate track and field performances of children of dissimilar ages. Reliability of track and field events for visually handicapped children received some consideration. Evidence was introduced to show that the selection of tests used in the battery probably measure gross motor performance as reliably as any device available at the present time.

Conclusions

From the data presented in this study, it seems reasonable to draw the following conclusions:

(1) On all levels of the Iowa Brace Test, the scores of the visually handicapped fall far below those of seeing children. The weakness of children with defective vision seems to be general, rather than specific in nature. In no one factor, body control, static balance, coordination, or agility, do they consistently fall below seeing children. By giving the visually handicapped a third trial in the Iowa Brace Tests, their scores are not raised enough to be equal to those of seeing children.

(2) In most track and field events, mean scores for pupils in schools for the blind fall far below those for seeing children. The visually handicapped score lowest in the basketball throw for distance and perform significantly better in running than in throwing. Due to intensive training in the event, high school boys with defective vision excel the seeing in the standing broad jump. The mean scores in running and jumping

of older pupils in schools for the blind more nearly approach the norms for the seeing than do the scores of the younger visually handicapped children. Boys with defective vision perform relatively better than do girls. Special schools usually provide more physical education for the male sex.

(3) The weakness of the visually handicapped in track and field is a result of limited physical activity before entering school. This is caused by lack of vision and parental overprotection. Also, blind children have particular difficulty in learning to throw, and fear of injury, weaving back and forth, and holding on to a guide wire are handicaps in running.

(4) In comparison with the seeing, children with defective vision perform just as consistently in track and field events. Correlation coefficients between trials are over .90 for the visually handicapped.

(5) When the track and field performances of the blind and partially seeing were compared on Buell's achievement scales, some significant differences were found. The partially seeing excelled in running and throwing, and in the girls' broad jump. In the boys' broad jump older pupils performed equally as well as did the partially seeing.

(6) In the Iowa Brace Test, the partially seeing score better than the blind in both elementary groups and the junior high school level for girls. There is little difference between the scores of the blind and the partially seeing on the high school level and for the boys in junior high school. This would indicate that blind girls and boys make good progress in the ability to use their muscles after entering school. There is not much difference in the performance of the blind and partially seeing in most stunts of the Iowa Brace Test. The partially seeing definitely excel in two stunts of balance, one foot--touch head and one knee--head to floor, in which the blind have difficulty in judging the distance of the upper part of the body from the floor.

(7) Overprotected blind and partially seeing boys and girls perform below normal in running, jumping, throwing, and on most levels of the Iowa Brace Test, while there is little difference between the performances of neglected visually handicapped children and those with normal home backgrounds. For children in schools for the blind, the attitude of parental overprotection influences performance in track and field events, and scores on a stunt type test. In so far as motor performance is concerned, parental neglect is to be preferred to overprotection.

(8) Children who lose their vision after six years of age do not have as much difficulty in adjusting to physical activities as do those blind from early childhood. Recently blinded girls perform better in running, throwing, and jumping. Boys who lose their vision after six years of age throw the basketball further than do those who have never seen this intricate act. The visual factor is very important in learning to throw.

(9) In the classification plan now commonly used in schools for the blind, boys and girls whose sum of exponents is below 12 do not perform as well in running, throwing, and jumping, as do children whose sum of exponents is between 13 and 20. A class should be added for the younger boys, and another for the girls.

(10) A high correlation exists between the empirical plan now used to classify children with defective vision and the best-fit indexes developed in this study. Age and height have somewhat similar weightings in the classification of seeing and visually handicapped children. Because of low correlations between performance and the factors of age, height and weight, valid classification indexes have not been developed for either seeing or visually handicapped secondary school girls.

(11) The classification of visually handicapped students differs from that of seeing children in some respects. In elementary and junior high schools, weight influences the performance of seeing students much more than that of children with defective vision. Correlations between performance and age, height and weight are much higher for secondary school seeing boys than for visually handicapped boys of high-school age.

(12) Some of the achievement scales in Sports for the Blind are in need of revision because they are too difficult for the boys and girls. The records of the National Athletic Association of Schools for the Blind, upon which some of these scales were based, are not representative of the performance of visually handicapped children in running, jumping, and throwing. Since the blind perform below the partially seeing in most track and field events, separate scales should be constructed for the two groups. It is hoped the weaknesses referred to above have been overcome in the achievement scales presented in this study.

(13) In comparison with achievement scales for seeing children, the scales for those with defective vision cover a wider range of performance. In the scales presented here, there is

a tendency for the range of performance below the mean to exceed that above the mean.

Implications

Among the factors which affect the motor performance of visually handicapped children and which should help guide teachers of physical education are: (1) amount of vision, (2) duration of visual handicap, (3) attitude of parents toward their children, and (4) the physical education received in school and elsewhere.

It is hoped that this study may, in some measure, serve to stimulate and direct those who are interested in advancing the status of physical education for visually handicapped children. Claims and beliefs are futile arguments for this costly program of special education. If physical education for children with defective vision is to receive the recognition it deserves, facts must be produced. Workers in the field must approach their problems with more objectivity, intelligence, and enthusiasm

BIBLIOGRAPHY*

American Association of Instructors of the Blind, Proceedings. (The biennial report is not published at a permanent location but may be borrowed from the American Foundation for the Blind.)

Reports contain papers on various aspects of the education of the blind. Usually two or three papers on physical education are presented. These papers are of limited value because they are based upon opinion rather than the objective approach. The theories presented are usually better than the practice.

Bauman, Mary K. "Studies in the Application of Motor Skills in the Vocational Adjustment of the Blind," Journal of Applied Psychology, Vol. 30, No. 2 (1946), pp. 144-54.

Best, Harry. Blindness and the Blind in the United States (New York: The Macmillan Company, 1934). 714 pp.

The most comprehensive work on the blind in the United States. Data are presented relative to causes and prevention of blindness. Provisions for the education of the blind are given in some detail. The viewpoint is more sociological than educational.

Bovard, J. F., et. al. Tests and Measurements in Physical Education (Philadelphia: W. B. Saunders Company, 1949).

Brace, D. K. Measuring Motor Ability (New York: A. S. Barnes and Company, 1927. [out of print]).

Buell, Charles E. Sports for the Blind (New York: American Foundation for the Blind, 1947). 240 pp.

A comprehensive treatise on physical education for the blind, including sports, outdoor and indoor games, contests,

*Most references on the blind are annotated because they are not easily obtained. Two other references are annotated because the titles might mislead the reader to believe that information on the blind is included.

dancing, corrective work, and foot travel. Original research is presented on the measurement of the physical fitness of the blind. Physical education achievement scales for visually handicapped boys and girls are included.

Buell, Charles E. The Education of the Negro Blind in the United States (New York: American Foundation for the Blind, 1945). 50 pp.

This is a published master's thesis. Curriculum receives most attention in an objective approach, but reference is also made to testing and other problems in the education of the Negro blind.

----------. "Physical Fitness Testing in a School for the Blind," Outlook for the Blind, December, 1945, pp. 280-82.

Coleman, J. W. "Pure Speed as a Positive Factor in Some Track and Field Events," Research Quarterly, May, 1940.

College of Teachers of the Blind. Physical Education of the Blind (London: The College, 1933). 100 pp.

Eight lectures given at a summer course in England are included. The papers on applied anatomy, posture, and remedial work are of value. Dancing is mentioned several times, but other activities receive little attention.

Cozens, F. W., et al. Achievement Scales in Physical Education Activities for Secondary School Girls and College Women (New York: A. S. Barnes and Company, 1937).

----------. Physical Education Achievement Scales for Boys in Secondary Schools (New York: A. S. Barnes and Company, 1936).

Degnan, W. J. A Health Education Program for Blind Boys in High School of the City of New York (typewritten master's thesis, College of the City of New York, 1934). 118 pp.

Although this is probably the best reference on physical education of the blind in public schools, little of value is added to existing information. The thesis is based upon experience with only thirteen boys. It is one man's opinion of how the blind can take part in calisthenics, apparatus work, swimming, track and field, football, rhythmics, and corrective gymnastics. A few games are described. The theoretical aspects of the work are of more value than the suggested adaptations of various activities.

Espenschade, Anna. "Development of Motor Coordination in Boys and Girls," Research Quarterly, 18:1 (March, 1947), pp. 30-43.

Espenschade, Anna. Motor Performance in Adolescence, Monographs Society for Research in Child Development, Vol. I (Washington, D. C., 1940).

Farris, L. P. Visual Defects as Factors Influencing Achievement in Reading (Doctor of Education thesis, University of California, 1936).

The Stanford Achievement Test in Reading was given to a large sample of children with several types of visual defects in the public schools of Oakland, California. It was found that eye defects have no influence on reading achievement. Those with visual defects make more exertion to gain the same result.

Foote, Doreen. Modified Activities in Physical Education (Inor Publishing Company, 1945). 101 pp.

The teacher of sight-saving classes will find this book helpful, but it is of limited value to the blind. Children with no vision can use most of the posture and rhythm exercises and some of the camping skills. The book suggests many recreational activities for corrective physical education. These can be used to supplement formal gymnastics.

French, R. S. From Homer to Helen Keller (New York: American Foundation for the Blind, 1932). 298 pp.

An excellent historical treatise dealing with the education and care of the blind, in which problems of education, vocation, and avocation are raised.

Garrett, H. E. Statistics in Psychology and Education (New York: Longmans, Green and Company, 1947). 487 pp.

Hastings, Homer. An Investigation of Some Aspects of the Personality of the Blind (unpublished master's thesis, University of California, 1947).

This is perhaps the best single reference on the objective approach of studying the personality of the blind. Evaluations are made of previous studies in the field. The California Test of Personality and the Mental Health Analysis were used at the California School for the Blind. Results of these tests are given in detail.

Hathaway, Winifred. Education and Health of the Partially Seeing Child (New York: Columbia University Press, 1943). 216 pp.

The most comprehensive work on the education of the partially seeing child in the United States. Among other aspects of the work, it deals with the eye and eye hygiene; vision tests; educational provisions and problems; equipment; and organizations interested in those with partial vision. Physical education and recreation receive no attention.

Hayes, S. P. Contributions to a Psychology of Blindness (New York: American Foundation for the Blind, 1941). 296 pp.

The best single reference on the subject by the leading authority in the field. Part I deals with certain problems in the psychology of blindness; sensory compensation; facial vision; memory; and intelligence and amount of vision. Mental measurements in schools for the blind are discussed in detail in Part II.

----------. Vocational Aptitude Tests for the Blind (Watertown, Massachusetts: Perkins Institution for the Blind, 1946). 32 pp.

At present this is the best reference on aptitude tests for the blind. Musical, mechanical, and scholastic aptitudes are considered.

Lende, Helga. Books about the Blind (New York: American Foundation for the Blind, 1940). 215 pp.

A comprehensive bibliography covering all important literature on the blind which appeared before 1940. About 2700 annotated references are included, 150 relating to physical education and recreation. Much of this literature is repetitious and in many cases of a more emotional than factual character.

Lende, Helga., ed. What of the Blind? (New York: American Foundation for the Blind, 1938). 214 pp.

Among the subjects covered by this collection of nineteen papers are causes and prevention of blindness; the blind preschool child; education of the young blind; psychology of the blind; social adjustment of the adult blind; volunteer work with the blind; reading and recreation. The two

chapters on recreation were written by blind men, Dr. R. V. Merry and Dr. T. D. Cutsforth.

Lowenfeld, Berthold. Teachers of the Blind, Their Status and Salaries (New York: American Foundation for the Blind, 1941). 44 pp.

This complete survey discloses the fact that teachers in residential schools for the blind have the same professional training as do teachers in public schools, but that their salaries are far below those paid to public school teachers.

Lowenfeld, Berthold, ed. The Blind Preschool Child (New York: American Foundation for the Blind, 1948). 148 pp.

Social work aspects, educational aspects, and medical aspects of work with preschool blind children are treated by leading authorities in the field.

McCloy, C. H. "An Analytical Study of the Stunt Type Test as a Measure of Motor Educability," Research Quarterly, VIII, 3:46 (October, 1937).

----------. Tests and Measurements in Health and Physical Education (New York: Appleton-Century-Crofts, Inc., 1939).

----------. The Measurement of Athletic Power (New York; A. S. Barnes and Company, 1932).

Merry, Ralph. Problems in the Education of Visually Handicapped Children (Cambridge: The Harvard University Press, 1933). 243 pp.

Although this book is now somewhat out of date, it is probably the best single reference on the education of the blind in the United States. Based on an objective approach, the study evaluates what has been accomplished in the education of blind and partially seeing children. One chapter is devoted to health and physical education, but the material is very general in nature.

Meyer, O. F. A Study of Respective Values and Services of Public School Braille Classes and Residential Schools to Determine Which Plan of Educating the Blind Child is Better Suited to His Needs (master's thesis, Ohio State University, 1944).

The evaluation is based primarily upon a curriculum survey. The mental, rather than the social development of the blind is stressed.

Myler, Pauline, "A Study of the Motor Ability of the Blind," Masters thesis, University of Texas, 1936. (212 p. typewritten)

The Brace Motor Ability Tests were given to 192 pupils at the Texas School for the Blind. Since it is unlikely that one school is representative of all special schools, the results obtained are of limited value. Those engaged in research in physical education of the blind will be interested in the study — four fifths of which is devoted to causes of failure in the stunts used.

National Institute for the Blind. Games for the Blind (London: The Institute, 1936). 50 pp.

Games for blind boys and girls are described. A very helpful pamphlet.

Neilson, N. P., and Cozens, F. W. Achievement Scales in Physical Education Activities for Boys and Girls in Elementary and Junior High School (New York: A. S. Barnes and Company, 1939).

Osborn, V. E. Physical Education for Blind Girls (typewritten master's thesis, University of California, 1927).

Although this study is somewhat out of date, it is one of the best references in the field. For the most part, its approach is objective. However, secondary sources were used for the historical development and exaggerated claims are made for Bukh's gymnastics which are described in some detail. The chapters on dancing and games are particularly good. Although the games are not described, they are listed as suitable either for the blind or the partially seeing. The study is a result of experience gained in developing a program of physical education for girls in the California School for the Blind.

Overbrook Report. Annual report of the Overbrook School for the Blind, Philadelphia.

Outlook for the Blind. American Foundation for the Blind, New York, N. Y.

The professional magazine of this field. Most of the articles on the blind appear in the periodical which is published ten months of the year. It covers a wide variety of subjects, including physical education. Much of the literature is not objective in nature.

Perkins Report. Annual report of Perkins Institution for the Blind, Watertown, Massachusetts.

Petroskey, H. N. "A Study of Improvement in Fitness of College Freshmen Women," Research Quarterly, December 1945.

Quimby, N. F. A Study of the Curriculum of Residential Schools for the Blind (New York: American Foundation for the Blind, 1940). 221 pp.

The most complete survey of its kind. Information was obtained from questionnaires. Four pages are devoted to physical education activities in grades one to twelve.

Rogers, F. R. Tests and Measurements Programs in the Re-Direction of Physical Education (New York: Bureau of Publications, Teachers College, Columbia University, 1927).

Royal Normal College Report. Annual report of the Royal Normal College and Academy of Music for the Blind, London.

Sargent, D. A. "The Physical Test of a Man," American Physical Education Review, XXVI:188 (April, 1921).

Scholl, Geraldine. The Major Functions of Education Applied to Residential and Day School Classes for the Blind (master's thesis, Wayne University, 1947).

A survey of the current trends in the education of the blind. Data are obtained from questionnaires answered by over two-thirds of the special schools and classes for the blind. The social development of the blind child is stressed.

Seils, L. G. A Study of the Relationship between Physical Growth and Gross Motor Development of Primary Children (unpublished doctor's thesis, Boston University, 1948). [See also Research Quarterly, May 1949. p. 143.]

Speakman, Martha. Recreation for Blind Children. Publication No. 172, U. S. Department of Labor (Washington, D. C., 1927). 76 pp. (Out of print.)

A booklet full of valuable source material. A comprehensive list of plays and games suitable for children of all ages and for all occasions is given with details and directions.

Stafford, G. T. Sports for the Handicapped (New York: Prentice-Hall, Inc., 1939). 302 pp.

The book does not cover activities for the blind. However, teachers in special schools may find it of some value because the blind sometimes have more than one handicap.

Note: For further information on literature relating to the blind write to:

Librarian
American Foundation for the Blind
15 West Sixteenth Street
New York 11, New York

Appendix A

Physical Education Activities Questionnaire

Place five or six "X's" in each column and as many "O's" as needed. "X" indicates the activities on which you spend most time in each age group, while "O" indicates other less important activities in which your pupils participate. Write in any others not listed here. Please list the number of minutes a week each group is scheduled for physical education.

	10 to 12 yrs.		13 to 15 yrs.		Over 15 yrs.	
	Boys	Girls	Boys	Girls	Boys	Girls
Minutes per week						
Games, relays						
Tumbling						
Calisthenics						
Corrective work						
Marching tactics						
Folk dancing						
Wrestling						
Track and field						
Softball						
Football						
Bowling						
Swimming						
Cthers						

Do you have interscholastic competition?_____

What is the nature of the program?_____

_____

Appendix B

Scores of Visually Handicapped Boys on Achievement Scales for Seeing Boys

		Secondary Classes[1]					Elementary Classes[2]			
	Score	A	B	C	D	E	D	C	B	A
Dash	0-9	11	5	10	12	7	16	15	14	15
	10-19	5	2	2	3	1	6	7	5	3
	20-29	9	8	5	4	4	4	4	3	3
	30-39	8	6	10	10	4	5	3	4	4
	40-49	24	16	6	5	5	7	7	5	2
	50-59	27	14	5	6	9	2	3	9	6
	60-69	18	8	9	6	4	2	7	2	3
	70-79	16	3	2	2	1	1	4	2	1
	80-89	6	2	2	2	0	0	0	0	3
	90-99	6	2	2	5	0	0	0	0	3
	Number	130	66	53	55	35	43	50	44	43
	Mean	50.7	45.9	40.9	41.2	37.9	24.5	31.8	30.4	35.9
		A	B	C	D	E	D	C	B	A
Throw	0-9	37	20	21	28	5	7	11	4	1
	10-19	19	12	12	7	6	14	5	7	9
	20-29	13	15	5	9	13	10	13	13	13
	30-39	14	9	8	7	5	6	12	13	7
	40-49	17	7	3	1	4	4	6	5	7
	50-59	19	2	1	2	2	1	1	2	4
	60-69	3	0	2	0	0	0	1	0	2
	70-79	3	1	1	0	0	0	1	0	0
	80-89	3	0	0	1	0	0	0	0	0
	90-99	2	0	0	0	0	1	0	0	0
	Number	130	66	53	55	35	43	50	44	43
	Mean	30.8	21.8	20.0	16.9	25.4	23.6	26.3	27.7	31.5
		A	B	C	D	E	D	C	B	A
Jump	9-9	6	2	5	3	3	5	10	5	7
	10-19	3	1	1	4	1	4	3	4	3
	20-29	16	6	4	4	6	3	4	6	7
	30-39	10	3	4	6	4	4	7	9	4
	40-49	14	11	7	6	2	10	8	7	8
	50-59	26	9	11	12	6	8	2	4	4
	60-69	24	18	6	6	4	6	8	4	3
	70-79	16	10	7	8	5	3	5	4	5
	80-89	7	4	3	2	3	0	2	1	2
	90-99	8	2	5	4	1	0	1	0	0
	Number	130	66	53	55	35	43	50	44	43
	Mean	53.3	55.9	53.2	51.4	48.9	41.5	40.9	38.8	39.4

[1]F. W. Cozens, et al., Physical Education Achievement Scales for Boys in Secondary Schools (New York: A. S. Barnes Co., 1936).

[2]N. P. Neilson and F. W. Cozens, Achievement Scales in Physical Education Activities for Boys and Girls in Elementary and Junior High Schools (New York: A. S. Barnes Co., 1939).

Appendix C

Scores of Visually Handicapped Girls on Achievement Scales for Seeing Girls

Elementary Classes[1] (1)

	Score	A	B	C	D	E	F	G
Dash	0-9	13	12	9	11	13	17	13
	10-19	1	1	5	3	9	4	1
	20-29	4	1	3	2	7	1	4
	30-39	4	0	3	6	4	10	4
	40-49	4	8	1	3	8	7	0
	50-59	2	1	1	1	3	4	2
	60-69	2	0	1	0	0	2	0
	70-79	0	0	0	2	0	0	0
	80-89	0	0	0	0	1	0	0
	90-99	0	0	0	0	0	0	2
	Number	30	23	23	28	45	45	26
	Mean	24.2	21.9	19.7	24.5	24.5	25.8	23.4

		A	B	C	D	E	F	G
Throw	0-9	0	1	2	2	10	22	14
	10-19	2	5	1	7	11	7	2
	20-29	11	6	8	7	18	5	4
	30-39	7	7	4	7	3	4	3
	40-49	6	2	4	3	2	4	3
	50-59	2	2	2	0	0	2	0
	60-69	2	0	1	1	1	1	0
	70-79	0	0	1	0	0	0	0
	80-89	0	0	0	0	0	0	0
	90-99	0	0	0	1	0	0	0
	Number	30	23	23	28	45	45	26
	Mean	34.8	28.8	34.1	29.1	20.1	18.1	16.4

Secondary[2]

	Dash	Throw	Jump
0-9	33	20	11
10-19	15	29	14
20-29	9	32	17
30-39	15	17	16
40-49	22	11	14
50-59	20	14	16
60-69	5	2	19
70-79	4	1	8
80-89	3	0	10
90-99	0	0	1
Number	126	126	126
Mean	32.1	26.5	43.5

[1]N.P. Neilson and F. W. Cozens, Achievement Scales in Physical Education Activities for Boys and Girls in Elementary and Junior High Schools (New York: A. S. Barnes Co., 1939).

[2]F. W. Cozens, et al., Achievement Scales in Physical Education Activities for Secondary School Girls and College Women (New York: A. S. Barnes Co., 1937).

Appendix D

Comparison of Blind and Partially Seeing Boys by Classes — Buell's Achievement Scales*

	Class	A		B		C		D		E		F	
	Score	B	S	B	S	B	S	B	S	B	S	B	S
Dash	0-9	7	2	4	3	2	3	5	3	16	9	18	14
	10-19	3	3	2	3	2	6	3	4	2	6	1	5
	20-29	4	5	1	4	2	0	1	2	0	11	0	5
	30-39	6	4	6	6	3	3	3	3	1	5	1	4
	40-49	16	10	6	5	2	9	6	9	1	11	0	7
	50-59	6	23	8	9	3	6	0	7	2	12	2	4
	60-69	5	14	4	7	0	6	2	10	3	5	0	2
	70-79	5	12	3	3	1	9	2	5	1	8	2	4
	80-89	2	4	0	1	1	0	0	3	0	4	0	1
	90-99	0	6	0	3	0	6	0	4	0	0	0	1
	Number	54	83	34	44	16	48	22	50	26	71	24	47
	Mean	42.3	56.8	43.0	48.1	37.6	53.2	33.6	53.1	21.4	41.8	16.1	32.4

		A		B		C		D		E		F	
		B	S	B	S	B	S	B	S	B	S	B	S
Throw	0-9	11	8	5	0	1	0	1	0	1	0	1	0
	10-19	8	9	2	2	2	3	2	1	6	6	11	6
	20-29	10	8	6	8	4	5	3	5	4	8	5	10
	30-39	10	10	6	6	1	7	8	7	8	15	4	12
	40-49	8	13	1	10	4	13	6	17	6	24	3	12
	50-59	3	7	5	6	2	9	0	11	1	11	0	5
	60-69	1	12	5	5	1	5	2	5	0	3	0	2
	70-79	1	9	1	5	1	4	0	2	0	1	0	0
	80-89	0	3	1	2	0	2	0	0	0	1	0	0
	90-99	2	4	2	0	0	0	0	2	0	2	0	0
	Number	54	83	34	44	16	48	22	50	26	71	24	47
	Mean	29.7	45.0	41.0	47.0	37.0	47.2	35.4	47.9	30.2	42.1	23.1	35.8

		A		B		C		D		E		F	
		B	S	B	S	B	S	B	S	B	S	B	S
Jump	0-9	3	5	2	4	3	5	4	6	10	15	15	14
	10-19	4	7	4	4	0	6	4	5	3	3	3	3
	20-29	7	9	2	3	2	4	1	4	1	5	1	5
	30-39	5	7	5	7	1	7	2	4	2	9	1	8
	40-49	12	21	6	12	3	6	3	10	3	8	0	5
	50-59	11	13	7	8	2	6	1	8	0	9	1	4
	60-69	5	8	5	3	4	7	4	6	5	11	2	5
	70-79	4	8	1	2	1	4	2	4	2	10	1	3
	80-89	2	4	0	0	0	3	1	0	0	0	0	0
	90-99	1	1	2	1	0	0	0	3	0	1	0	0
	Number	54	83	34	44	16	48	22	50	26	71	24	47
	Mean	45.1	45.5	44.8	40.9	42.0	42.6	38.5	43.7	30.2	41.5	17.8	31.7

B — Blind S — Partially Seeing

* For achievement scales see Sports for the Blind.
For revised classification see Chapter IX and Appendix F of this study.

Appendix E

Comparison of Blind and Partially Seeing Girls by Classes — Buell's Achievement Scales*

	Class	A		B		C		D		E	
	Score	B	S	B	S	B	S	B	S	B	S
Dash	0-9	4	1	17	10	6	3	10	4	10	4
	10-19	1	3	6	2	2	2	0	2	0	4
	20-29	4	2	6	4	5	2	4	2	0	2
	30-39	3	4	6	3	8	11	3	3	0	6
	40-49	2	6	4	5	0	9	2	5	2	3
	50-59	4	4	6	15	4	9	1	10	0	8
	60-69	3	8	4	10	2	12	1	2	0	5
	70-79	2	4	1	1	0	4	0	2	0	0
	80-89	0	5	0	2	0	2	0	0	0	0
	90-99	0	1	0	3	0	1	0	1	0	0
	Number	23	38	50	57	27	55	21	31	12	32
	Mean	38.4	53.9	27.1	44.9	29.7	49.0	21.7	43.2	11.2	38.3

		A		B		C		D		E	
		B	S	B	S	B	S	B	S	B	S
Throw	0-9	7	1	4	2	1	0	0	0	0	0
	10-19	3	6	16	7	2	2	3	0	2	1
	20-29	9	11	14	14	8	11	3	2	7	9
	30-39	3	4	7	9	8	13	8	8	3	11
	40-49	0	5	5	8	4	21	7	5	0	7
	50-59	1	9	3	12	2	5	0	9	0	4
	60-69	0	1	1	4	1	1	0	4	0	0
	70-79	0	1	0	1	1	1	0	2	0	0
	80-90	0	0	0	0	0	1	0	0	0	0
	90-99	0	0	0	0	0	0	0	1	0	0
	Number	23	38	50	57	27	55	21	31	12	32
	Mean	19.7	35.6	25.7	37.0	34.4	39.6	33.5	49.7	25.3	35.6

		A		B		C		D		E	
		B	S	B	S	B	S	B	S	B	S
Jump	0-9	4	4	7	9	2	4	2	2	6	8
	10-19	3	2	5	5	4	3	6	0	0	1
	20-29	1	5	13	3	3	1	1	3	0	1
	30-39	4	4	4	5	2	4	2	2	1	1
	40-49	1	5	4	8	6	11	1	3	4	5
	50-59	5	2	4	6	0	17	5	3	0	3
	60-69	2	5	4	3	1	8	0	7	0	5
	70-79	2	8	4	8	5	0	2	5	1	4
	80-89	0	2	1	3	2	4	2	4	0	3
	90-99	1	1	4	7	2	3	0	2	0	1
	Number	23	38	50	57	27	55	21	31	12	32
	Mean	39.7	47.9	39.5	48.2	47.1	50.5	39.3	58.0	26.2	45.7

B Blind S Partially Seeing

* For achievement scales see Sports for the Blind.
For revised classification see Chapter IX and Appendix F of this study.

Appendix F

Calssification Chart Commonly Used in Schools for the Blind

Exponent	Height	Weight	Age	Exponent
1	50	60	10	1
	51	65	10-5	
2	52	66	10-6	2
	53	70	10-11	
3	54	71	11	3
	55	75	11-11	
4		76	12	4
		80	12-5	
5	56	81	12-6	5
	57	85	12-11	
6	58	86	13	6
	59	90	13-5	
7		91	13-6	7
		95	13-11	
8	60	96	14	8
	61	100	14-5	
9	62	101	14-6	9
	63	105	14-11	
10		106	15	10
		110	15-5	
11	64	111	15-6	11
	65	115	15-11	
12		116	16	12
		120	16-5	
13	66	121	16-6	13
	67	125	16-11	
14		126	17	14
		130	17-5	
15	68	131	17-6	15
	69	135	17-11	
16	over	136	18	16
	69	140	18-5	
17		over	over	17
		140	18-5	

Sum of Exponents*

Boys	Class	Girls	Class
43 and above	A	37 and above	A
36-42	B	29-36	B
30-35	C	21-28	C
21-29	D	20 and below	D
20 and below	E		

*Suggest that boys and girls with sum of exponents of 12 and below be placed respectively in Classes F and E.

Appendix G

Track and Field Achievement Scale Scores of Blind and Partially Seeing Overprotected Boys Compared With Balance of Sample*

	Dash				Throw				Jump				
Score	B	PB	S	PS	B	PB	S	PS	B	PB	S	PS	Score
0-9	19	33	22	12	12	8	7	1	12	25	35	14	0-9
10-19	9	4	19	8	14	17	20	7	12	6	24	4	10-19
20-29	7	1	23	4	22	10	40	4	11	3	28	2	20-29
30-39	16	4	23	2	31	6	51	6	11	5	35	7	30-39
40-49	28	3	48	3	24	4	71	18	24	3	56	6	40-49
50-59	20	1	55	6	10	1	45	4	22	0	43	5	50-59
60-69	14	0	41	3	8	1	30	2	20	5	38	2	60-69
70-79	13	1	38	3	3	0	21	0	11	0	28	3	70-79
80-89	3	0	11	2	1	0	7	1	3	0	7	0	80-89
90-99	0	0	20	0	4	0	8	0	3	0	6	0	90-99
Number	129	47	300	43	129	47	300	43	129	47	300	43	
Mean	41.9	13.4	50.5	32.2	36.3	21.9	45.1	38.2	44.9	19.2	43.1	30.3	

B--Blind
PB--Protected Blind
S--Partially Seeing
PS--Protected Partially Seeing

*Achievement scales in Buell's Sports for the Blind.

Appendix H

Track and Field Achievement Scale Scores of Blind and Partially Seeing Overprotected Girls Compared With Balance of Sample*

	Dash				Throw				Jump			
Score	B	PB	S	PS	B	PB	S	PS	B	PB	S	PS
0-9	28	19	13	9	8	4	1	2	9	12	22	5
10-19	6	3	11	2	11	15	14	2	10	8	8	3
20-29	15	4	12	0	31	10	40	7	16	2	11	2
30-39	15	5	26	3	23	6	39	6	10	3	15	1
40-49	7	3	26	2	15	1	45	1	10	6	27	5
50-59	14	1	45	1	6	0	38	1	12	2	30	1
60-69	9	1	35	2	2	0	9	1	6	1	27	1
70-79	3	0	11	0	1	0	5	0	12	2	23	2
80-89	0	0	8	1	0	0	1	0	5	0	16	0
90-99	0	0	6	0	0	0	1	0	7	0	14	0
Number	97	36	193	20	97	36	193	20	97	36	193	20
Mean	30.7	18.1	48.4	26.5	30.4	20.3	40.1	29.0	45.2	25.3	51.7	32.0

B--Blind
PB--Protected Blind
S--Partially Seeing
PS--Protected Partially Seeing

*Achievement scales in Buell's Sports for the Blind.

Appendix I

Iowa Brace Scores of Visually Handicapped Pupils

Score	Elementary		Junior High		High School	
	Boys	Girls	Boys	Girls	Boys	Girls
0	0	1	0	0	0	2
1	0	1	0	0	1	2
2	0	5	0	2	1	5
3	6	3	0	6	2	3
4	5	9	3	2	3	4
5	5	18	1	4	3	10
6	10	8	5	11	4	10
7	12	6	5	5	8	9
8	15	7	6	11	8	16
9	11	8	9	12	5	9
10	14	8	14	4	8	8
11	17	3	16	12	11	9
12	18	9	13	6	26	4
13	9	7	20	6	29	4
14	6	6	22	7	15	6
15	4	1	15	6	7	7
16	8	3	14	7	14	7
17	6	3	12	4	10	2
18	9	2	15	6	13	7
19	2	1	4	0	7	0
20	0	1	7	1	6	0
Number	157	110	181	112	181	124
Mean	10.57	8.63	13.20	10.40	12.77	9.35

Appendix J

Iowa Brace Scores of Blind and Partially Seeing Pupils

Score	Elementary				Junior High				High School			
	Boys		Girls		Boys		Girls		Boys		Girls	
	B	S	B	S	B	S	B	S	B	S	B	S
0	0	0	1	0	0	0	0	0	0	0	2	0
1	0	0	0	1	0	0	0	0	1	0	1	1
2	0	0	1	4	0	0	0	2	0	1	2	3
3	2	4	1	2	0	0	6	0	0	2	1	2
4	2	3	5	4	1	2	1	1	1	2	1	3
5	2	3	8	10	1	0	3	1	0	3	7	3
6	6	4	4	4	0	5	2	9	1	3	5	5
7	5	7	2	4	2	3	2	3	3	5	6	3
8	9	6	3	4	2	4	6	5	2	6	7	9
9	2	9	3	5	3	6	5	7	3	2	2	7
10	4	10	2	6	2	12	1	3	6	2	4	4
11	3	14	0	3	5	11	0	10	3	8	7	2
12	6	12	3	6	6	7	2	4	8	18	2	2
13	4	5	0	7	3	17	2	4	14	15	1	3
14	2	4	3	3	9	13	1	6	6	9	2	4
15	0	4	0	1	5	10	1	5	1	6	2	5
16	1	7	1	2	4	10	2	5	8	6	3	4
17	2	4	0	3	5	7	2	4	4	6	2	0
18	1	8	1	1	6	9	2	4	1	12	2	5
19	1	1	0	1	2	2	0	0	4	3	0	0
20	0	0	0	1	0	7	0	1	3	3	0	0
Number	52	105	38	72	56	125	38	74	69	112	59	65
Mean	9.56	11.08	7.53	9.21	13.36	13.14	9.13	11.51	12.97	12.64	8.86	9.78

B Blind S Partially Seeing

Appendix K

The Iowa Brace Test

Batteries of Tests

Elementary School
Boys — Tests 2, 3, 4, 7, 8, 10, 11, 13, 16, and 17
Girls— Tests 1, 3, 6, 8, 10, 11, 13, 16, 18, and 19

Junior High School
Boys — Tests 1, 2, 3, 6, 12, 13, 14, 16, 17, and 19
Girls — Tests 1, 2, 11, 12, 13, 15, 16, 17, 19, and 20

High School
Boys — Tests 1, 3, 5, 11, 14, 15, 16, 17, 20, and 21
Girls — Tests 2, 3, 7, 9, 11, 16, 17, 18, 19, and 20

Test 1. One Foot — Touch Head. Stand on left foot. Bend forward and place both hands on floor. Raise right leg and stretch it back. Touch the head to the floor, and regain the standing position without losing the balance. Do not step about or touch the floor with the right foot.

Test 2. Side Leaning Rest. Sit down on the floor, legs straight out and feet together. Put the right hand on the floor behind you. Turn to the right and take a side leaning-rest position, resting on the right hand and the right foot. Raise the left arm and keep this position for five seconds.

Test 3. Grapevine. Stand with both heels tight together. Bend down, extend both arms down between the knees, around behind the ankles, and hold the fingers together in front of the ankles without losing the balance for five seconds.

Test 4. One Knee Balance. Face to the right. Kneel down on one knee with the other leg raised from the floor and arms stretched out at the sides. Hold your balance for five seconds.

Test 5. Stork Stand. Stand on left foot. Hold the bottom of the right foot against the inside of the left knee. Place the hands on the hips, shut both eyes and hold the position for ten seconds without shifting the left foot about on the floor. Do not take right foot down or remove the hands from the hips.

Test 6. Double-Heel Click. Jump into the air and clap the feet together twice and land with feet apart, so that they do not touch each other.

Test 7. Cross Leg Squat. Fold the arms across the chest. Cross the feet and sit down cross-legged. Get up without unfolding the arms or moving the feet about to regain balance.

Test 8. Full Left Turn. Stand with feet together. Jump into the air and make a full turn to the left, landing on the same spot. Do not move feet after they strike the floor.

Test 9. One Knee — Head to Floor. Kneel on one knee with the other leg stretched out behind, not touching the floor, the arms at side parallel to the floor; bend forward and touch the head to the floor and raise the head from the floor without losing the balance.

Test 10. Hop Backwards. Stand on either foot. Close the eyes and take five hops backwards. Do not open eyes or drop the other foot.

Test 11. Forward Hand Kick. Jump upward, swinging the legs forward, bend forward and touch the toes with both hands before landing. Keep the knees at an angle of more than 45 degrees.

Test 12. Full squat — Arm Circles. Take a full squat position with arms out sidewise. Wave the arms so that the hands make a circle about one foot across, and jiggle up and down at the same time for ten seconds. Do not move the feet about on the floor or lose the balance.

Test 13. Half Turn Jump. Stand on left foot and jump one half turn to the left, keeping the balance.

Test 14. Three Dips. Take a front leaning-rest position, placing the hands on the floor. With arms straight, extend feet back along the floor until the body is straight. Bend arms, touching the chest to the floor, and push up again to straighten arms. Do this three times in succession. Do not touch the floor with legs or waist.

Test 15. Side Kick. Throw the left foot sideways to the left, jumping upward from the right foot; strike the feet together in the air and land with the feet apart. The feet should strike outside the left shoulder line.

Test 16. Kneel, Jump to Feet. Kneel on both knees. Extend the toes of both feet out flat behind. Swing the arms and jump to the feet without rocking back on the toes or losing the balance.

Test 17. Russian Dance. Squat clear down; stretch one leg forward; do a Russian dance step by hopping to this position with first one leg extended, then the other; do this twice with each leg. The heel of the forward foot may touch the floor.

Test 18. Full Right Turn. Similar to Test 8, but turn to the right.

Test 19. The Top. Sit down; put the arms between the legs and under and behind the knees; grasp the ankles; roll rapidly around to the right with the weight first over the right knee, then the right shoulder, then on back, then left shoulder, then left knee; then sit up facing in the opposite direction from that in which you started. Repeat from this position and finish in the same direction from which you started. Do not let go of ankles.

Test 20. Single Squat Balance. Squat clear down on either foot. Stretch the other leg forward off the floor, hands on the hips. Hold this position for five seconds. Do not remove hands from hips or touch the floor with the extended foot.

Test 21. Jump Foot. Hold the toes of either foot in the opposite hand. Jump up and jump the free foot over the foot that is held, without letting go.

Appendix L

Comparison of Overprotected Pupils With Balance of Sample in Track and Field Events*

	Balance of Sample			Overprotected				
	N	M	SD	N	M	SD	D	CR
Blind Boys								
Dash	129	61.79	18.03	47	38.33	18.00	23.46	7.64
Throw	129	52.87	18.10	47	39.18	13.86	13.69	5.33
Jump	129	57.29	17.61	47	38.12	17.03	19.17	6.33
P.S. Boys								
Dash	300	57.30	21.89	43	42.41	21.87	14.89	4.18
Throw	300	51.17	16.79	43	42.42	13.90	8.75	3.76
Jump	300	53.00	17.06	43	40.55	18.53	12.45	4.16
Blind Girls								
Dash	97	54.60	17.29	36	43.94	18.87	10.66	2.96
Throw	97	56.87	18.60	36	45.61	15.07	11.26	3.59
Jump	97	54.71	18.11	36	45.89	17.94	8.82	2.51
P.S. Girls								
Dash	193	53.88	17.52	20	38.00	21.09	15.88	3.25
Throw	193	50.77	16.59	20	40.50	16.04	10.27	2.72
Jump	193	60.20	25.04	20	41.00	18.14	19.20	4.32

P.S. — Partially Seeing

*Mean scores were obtained from achievement scales in the present study. When achievement scales in Sports for the Blind are used, the critical ratios obtained are about the same as those shown above. See page 56.

Appendix M

Relation of Performance in Track and Field Events to Time of Loss of Vision*

	Blind From Birth			Blinded After Six Years of Age				
	N	M	SD	N	M	SD	D	CR
Girls								
Dash	67	30.0	24.54	30	32.8	23.66	2.8	0.54
Throw	67	29.3	14.39	30	31.8	15.26	2.5	0.77
Jump	67	45.1	26.19	30	45.5	28.67	0.4	0.06
Boys								
Dash	84	40.3	22.90	45	44.9	21.70	4.6	1.12
Throw	84	32.2	18.60	45	44.1	21.19	11.9	3.13
Jump	84	43.3	24.27	45	48.3	19.60	5.0	1.25

*Mean scores refer to scores on achievement scales in Sports for the Blind. When achievement scales of the present study are used, the critical ratios are higher, particularly for the girls. See page 62.

Appendix N

Some Computations Required to Obtain Classification Indexes for Partially Seeing Elementary Boys in Running, Throwing, and Jumping

Zero-Order Correlations				Variable	Standard Deviation
	Age	Height	Weight	1. Dash	1.1455 seconds
Height	.7713			1. Throw	17.6351 feet
Weight	.7382	.8156		1. Jump	1.3009 feet
Dash	.4935	.4737	.4351	2. Age	1.9122 years
Throw	.6683	.6099	.6855	3. Height	5.5404 inches
Jump	.5661	.5970	.5058	4. Weight	26.1500 pounds

	Dash	Throw	Jump
r12.3	.2282	.3003	.2059
r14.3	.0957	.1203	.0406
r24.3	.2951	.2951	.2951
r13.2	.1679	.3681	.3047
r14.2	.1211	.2395	.1584
r34.2	.5738	.5738	.5738
r12.34	.2103	.2791	.2031
r13.24	.1211	.2093	.2647
r14.23	.0308	.0372	- .0210
ó1.234	0.9803	12.1554	1.0221
ó2.134	1.1408	1.1191	1.1422
ó3.124	2.8714	2.7678	3.2323
ó4.123	13.9188	14.4723	14.4767
R1.234	.5461	.7245	.6186
b12.34	.1807	3.0315	.1818
b13.24	.0413	1.2749	.0837
b14.23	.0022	0.0312	- .0015

Running Index — $\frac{1A + .229H + .012W}{}$

Throwing Index — $\frac{1A + .421H + .010W}{}$

Jumping Index — 1A + .460H - .008W

Number of cases — 266.

Note. For description of techniques used in Appendixes N, O, P, and Q, see pages 288-290 in Bovard's Tests and Measurements in Physical Education.

Appendix O

Some Computations Required to Obtain Classification Indexes for Blind Elementary Boys in Running, Throwing and Jumping

Zero-Order Correlations				Variable	Standard Deviation
	Age	Height	Weight	1. Dash	1.6532 seconds
Height	.6769			1. Throw	17.2713 feet
Weight	.6814	.8208		1. Jump	1.4549 feet
Dash	.6946	.6422	.4805	2. Age	1.8321 years
Throw	.6841	.6519	.6529	3. Height	5.4357 inches
Jump	.7554	.6919	.5608	4. Weight	25.7120 pounds

	Dash	Throw	Jump
r12.3	.4585	.4330	.5376
r14.3	- .1060	.2708	- .0171
r24.3	.2979	.2979	.2979
r13.2	.3244	.3512	.3733
r14.2	.0136	.3497	.2271
r34.2	.6647	.6647	.6647
r12.34	.5166	.3839	.5690
r13.24	.4223	.1698	.3053
r14.23	- .2860	.1662	- .0303
ó1.234	1.0774	11.6258	0.8840
ó2.134	1.1053	1.190C	1.0594
ó3.124	2.7211	2.9517	2.8528
ó4.123	13.4790	13.8467	14.0320
R1.234	.7585	.7396	.7942
b12.34	.5036	3.7505	.4748
b13.24	.1672	.6688	.0946
b14.23	- .0229	.1395	- .0019

Running Index $= \frac{1A + .332H - .046W}{}$

Throwing Index $= \frac{1A + .178H + .037W}{}$

Jumping Index $= \frac{1A + .199H - .004W}{}$

Number of cases = 120.

Appendix P

Some Computations Required to Obtain Classification Indexes for Partially Seeing Elementary Girls in Running, Throwing, and Jumping

Zero-Order Correlations				Variable	Standard Deviation
	Age	Height	Weight	1. Dash	1.0024 seconds
Height	.6215			1. Throw	8.6285 feet
Weight	.4850	.6813		1. Jump	0.9626 feet
Dash	.5389	.4048	.1238	2. Age	1.7495 years
Throw	.6813	.5473	.4258	3. Height	2.9998 inches
Jump	.5989	.3932	.1695	4. Weight	20.5675 pounds

	Dash	Throw	Jump
r12.3	.4005	.5186	.4918
r14.3	- .2267	.0860	- .1461
r24.3	.1071	.1071	.1071
r13.2	.1058	.2154	.0335
r14.2	- .1869	.1488	- .1730
r34.2	.3537	.5537	.5537
r12.34	.4384	.5141	.5154
r13.24	.2560	.1617	.1579
r14.23	- .2967	.0363	- .2303
ó1.234	0.8017	6.1726	0.7490
ó2.134	1.2259	1.1702	1.1702
ó3.124	1.8932	1.9328	1.9328
ó4.123	14.3294	14.9876	14.5948
R1.234	.6003	.6987	.6282
b12.34	.2867	2.7118	.2206
b13.24	.1084	.5164	.0612
b14.23	- .0166	.0149	- .0118

Running Index $= \underline{1A + .378H - .058W}$

Throwing Index $= \underline{1A + .190H + .006W}$

Jumping Index $= \underline{1A + .277H - .054W}$

Number of cases = 145.

Appendix Q

Some Computations Required to Obtain Classification Indexes for Blind Elementary Girls in Running, Throwing, and Jumping

Zero-Order Correlations				Variable	Standard Deviation
	Age	Height	Weight		
Height	.6988			1. Dash	1.4718 seconds
Weight	.5957	.6843		1. Throw	9.4380 feet
Dash	.7177	.6421	.6326	1. Jump	1.0591 feet
Throw	.7730	.7654	.6634	2. Age	1.7019 years
Jump	.7459	.6569	.4617	3. Height	4.3806 inches
				4. Weight	21.2474 pounds

	Dash	Throw	Jump
r12.3	.5887	.5177	.5317
r14.3	.3451	.2975	.0222
r24.3	.2258	.2258	.2258
r13.2	.2256	.4982	.2848
r14.2	.3372	.4142	.0325
r34.2	.4670	.4670	.4670
r12.34	.5585	.4843	.5406
r13.24	.0816	.3784	.3047
r14.23	.2687	.2367	- .1184
ó1.234	0.8810	5.0295	0.6723
ó2.134	0.9811	1.0356	0.9968
ó3.124	2.7605	2.5618	2.6376
ó4.123	14.5250	14.6628	14.9752
R1.234	.8011	.8462	.7727
b12.34	.5015	2.3521	.3646
b13.24	.0260	.7429	.0777
b14.23	.0163	.0812	- .0449

$$\text{Running Index} = \frac{1A + .052H + .033W}{}$$

$$\text{Throwing Index} = \frac{1A + .316H + .035W}{}$$

$$\text{Jumping Index} = \frac{1A + .213H - .123W}{}$$

Number of cases — 75.

Appendix R

Zero-Crder Correlations for Track and Field Performances and Age, Height and Weight of Partially Seeing Secondary School Boys

	Age	Height	Weight
Height	.3518		
Weight	.4328	.7685	
Dash	.3345	.2164	.1556
Throw	.2094	.2798	.1899
Jump	.6076	.3502	.2391

Number of cases — 140 boys 15 years of age and over.

Appendix S

Zero-Order Correlations for Track and Field Performances and Age, Height and Weight of Blind Secondary School Boys

	Age	Height	Weight
Height	.2387		
Weight	.3763	.5857	
Dash	.0416	.2638	.2058
Throw	- .0027	.2320	.2842
Jump	.0247	.3141	.2158

Number of cases — 92 boys 15 years of age and over.

Appendix T

Zero-Crder Correlations for Track and Field Performances and Age, Height and Weight of Visually Handicapped Secondary School Girls

	Age	Height	Weight
Height	- .1654		
Weight	.0488	.4427	
Dash	- .3610	.2288	- .1228
Throw	- .2598	.3290	.0121
Jump	- .2090	.0973	.2216

Number of cases — 167 blind and partially seeing girls 15 years of age and over.